

12

AD A125379

Research Product 81-9

TRAINING MATERIALS AND DATA REQUIREMENTS FOR TURRET
ORGANIZATIONAL MAINTENANCE TRAINER (TOM-T) TRAINING
TEST SUPPORT PLAN

ARI FIELD UNIT AT FORT KNOX, KENTUCKY

May 1980

DTIC FILE COPY

DTIC
ELECTE
S MAR 3 1983

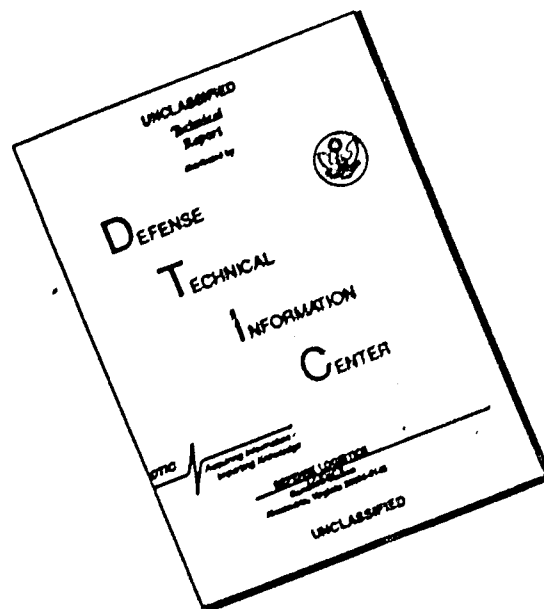
83 03 02 006

B



U.S. ARMY RESEARCH INSTITUTE for the BEHAVIORAL and SOCIAL SCIENCES

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

JOSEPH ZEIDNER
Technical Director

FRANKLIN A. HART
Colonel, US Army
Commander

Research accomplished under contract
to the Department of the Army

Human Resources Research Organization
(HumRRO)

DISSEMINATION STATEMENT: This report is the property of the U.S. Army and is loaned to you. It and its contents are not to be distributed outside your agency.

NOTE: This Report is available in microfiche format only.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Research Product 81-9	2. GOVT ACCESSION NO. AD-A125379	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) TRAINING MATERIALS AND DATA REQUIREMENTS FOR TURRET ORGANIZATIONAL MAINTENANCE TRAINER (TOM-T) TRAINING TEST SUPPORT PLAN		5. TYPE OF REPORT & PERIOD COVERED Research Product rept.
7. AUTHOR(s) James H. Harris, Charlotte H. Campbell, (HumRRO) David W. Bessemer, (ARI)		6. PERFORMING ORG. REPORT NUMBER RP-MTRO(KY)-80-16
9. PERFORMING ORGANIZATION NAME AND ADDRESS Human Resources Research Organization (HumRRO) PO Box 293 Fort Knox, Kentucky 40121		8. CONTRACT OR GRANT NUMBER(s) MDA 903-79-C-0050 0582
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, VA 22333		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q762722A777
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE May 1980
		13. NUMBER OF PAGES 439
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Prepared with conceptual contributions from Dr. D. W. Bessemer, ARI Field Unit, Fort Knox.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Independent Evaluation Plan (IEP) Training Effectiveness Test Support Plan (TSP) Turret Organizational Maintenance Trainer (TOM-T) Measurement Criteria Data Requirements		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The material presented in this training test support plan for the XM1 45E turret organizational maintenance trainer was developed for use during OT II, to answer three of the operational issues asked in the IEP for the TOM-T, namely: Issue 2.2.2 Is the TOM-T training effective in teaching MOS 45E turret mechanics organizational maintenance level troubleshooting, repair, and replacement		

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

1 SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

Item 20 (Cont'd)

when used in the context of the program
of instructions?

Issue 2.2.3 What is the training transfer of the TOM-T?

Issue 2.2.4 What are the training resource requirements
used to conduct the XML TOM-T program of
instruction?

TRAINING MATERIALS AND DATA REQUIREMENTS FOR TURRET
ORGANIZATIONAL MAINTENANCE TRAINER (TOM-T) TRAINING
TEST SUPPORT PLAN

James H. Harris and Charlotte H. Campbell
Human Resources Research Organization (HumRRO)

and

David W. Bessemer
Army Research Institute

Submitted by:
Donald F. Haggard, Chief
ARI FIELD UNIT, FORT KNOX, KENTUCKY

Approved by:
E. Ralph Dusek, Director
PERSONNEL AND TRAINING
RESEARCH LABORATORY

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 Eisenhower Avenue, Alexandria, Virginia 22333

Office, Deputy Chief of Staff for Personnel
Department of the Army

May 1980

Army Project Number
2Q762722A777

Individual Training Technology

Approved for public release; distribution unlimited.

FOREWORD

The Fort Knox Field Unit of the Army Research Institute for the Behavioral and Social Sciences (ARI) carries out research and exploratory development in the area of Armor training. An objective of this work is to develop through analytic and field research, tank crew and individual training methods that are effective and efficient.

The project of which this report is a part was conducted by personnel of the Human Resources Research Organization (HumRRO) under Contract No. MDA903-79-C-0582 and monitored by Donald F. Haggard, Chief of ARI Field Unit at Fort Knox. The research was done under ARI FY 78 Work Program, Army Project 2Q762722A777, Individual Training Technology, Task D: Technology for Front-End Analysis of Armor Systems, Work Unit 3: Simulation Characteristics of Armor Systems. The work is responsive to requirements of the US Army Armor School at Fort Knox and the Army Training and Doctrine Command.


JOSEPH ZEIDNER
Technical Director



Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
PER CALL JC	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

SUMMARY

The material in this training TSP for the XM1 45E TOM-T was developed for use during OT II, to answer three of the operational issues asked in the IEP for the TOM-T namely:

- Issue 2.2.2 Is the TOM-T training effective in teaching MOS 45E turret mechanics organizational maintenance level troubleshooting, repair, and replacement when used in the context of the program of instruction?
- Issue 2.2.3 What is the training transfer of the TOM-T?
- Issue 2.2.4 What are the training resource requirements used to conduct the XM1 TOM-T program of instruction?

The experimental training for the TOM-T comprises 16 modules. Training and test plans were developed for eight of the modules. [The development of training and test plans for the other modules was beyond the purview of the project; materials for these modules are available in the Army as a standard part of instruction for 45E turret mechanics.] The eight modules for which materials were developed are:

- Module A 19E Operator Requirements
- Module B Turret Assembly
- Module C NBC System
- Module D Armament System
- Module E Hydraulic System
- Module F STE/XM1 Test Set
- Module G Turret Electrical System
- Module H Fire Control System

Each module comprises several components, which in turn comprise tasks. The module, 19E Operator Requirements, for example, comprises the components Prepare Gunner's Station for Operation, Perform Pre-Operation Checks, and others. The component, Perform Pre-Operations Checks, in turn, comprises two tasks: Perform Computer Self-test and Perform Bore-sight Check.

An outline was prepared for each component and contains a section entitled "Measurement", which specifies time and accuracy measures to be obtained during and after training. The time measures are in all cases the time between the end of the initiating stimuli to which the soldier is expected to respond, and the completion of the desired response. Accuracy standards are given usually in terms of the extent of correspondence between the task steps performed and the steps in a perfect performance.

To evaluate the effectiveness of the maintenance training program, data forms were prepared to collect data in three areas:

1. End of training qualification testing (Issue 2.2.2)
2. Job performance evaluation (Issue 2.2.3)
3. Training resource requirements (Issue 2.2.4)

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
ORGANIZATION	2
CHAPTER 1 TRAINING CONCEPTS FOR TOM-T TSP.	3
Overview.	3
Test Participants and Dates	6
Tasks for Training	6
Training Materials	21
Lesson Plan Outline	21
Component Outline	21
Task Analysis Outline	24
Publications	25
CHAPTER 2 DATA REQUIREMENTS	29
Training Resource Requirements	29
Personnel Requirements	29
Mechanic Report Form	30
Equipment Usage	30
End of Training Qualification Testing	31
Job Performance Evaluation	32
APPENDIXES	34

LIST OF TABLES AND FIGURES

Page

TABLES

1. XM1 EQUIPMENT PUBLICATIONS 26

FIGURES

1. Training concept overview: XM1 45E turret mechanic 4
2. Sample lesson plan outline for the turret assembly module 22
3. Sample component outline for the traverse gearbox assembly 27
4. Sample task analysis outline for adjust backlash setting 28

INTRODUCTION

Recognizing both the potential benefits and the potential risks associated with the use of training devices and simulators as adjuncts and substitutes for operational equipment, the Army has evolved a multi-tiered assessment policy, in which plans and devices are evaluated at successive phases of development, from concept evaluation to operational testing. Certain parts of the Army's device-evaluation policy, namely the parts that deal with the design of baseline and experimental courses of instruction to address operational issues defined in the Independent Evaluation Plan (IEP), and the design and preparation of specifications for elements of the training Test Support Package (TSP) are interrelated to the extent that one part (the TSP) is "required" by the other part (the IEP).

The material presented in this training TSP for the XM1 45E turret organizational maintenance trainer (TOM-T) was developed for use during OT II, to answer three of the operational issues asked in the IEP for the TOM-T,¹ namely:

- Issue 2.2.2 Is the TOM-T training effective in teaching MOS 45E turret mechanics organizational maintenance level troubleshooting, repair, and replacement when used in the context of the program of instruction?
- Issue 2.2.3 What is the training transfer of the TOM-T?
- Issue 2.2.4 What are the training resource requirements used to conduct the XM1 TOM-T program of instruction?

¹Author. Final Independent Evaluation Plan for XM1 Turret Organizational Maintenance Trainer (TOM-T). 20 March 1980.

ORGANIZATION

The training materials and data requirements are organized as follows:

Chapter 1 Training Concept for TOM-T TSP

Chapter 2 Data Requirements

Appendix A 19B Operator Requirements

Appendix B Turret Assembly

Appendix C NBC System

Appendix D Armament System

Appendix E Hydraulic System

Appendix F STE/XML Test Set

Appendix G Turret Electrical System

Appendix H Fire Control System

Appendix I Performance-Oriented Instruction

Appendix J Test Development

Appendix K Training Resource Requirement Forms

CHAPTER 1

TRAINING CONCEPTS FOR TOM-T TSP

Overview

The experimental training for soldiers using the TOM-T comprises 16 modules, whose titles are shown in Figure 1. The seven asterisked modules are ones for which the development of training plans was outside our purview; training modules for the asterisked items are available in the Army as a standard part of instruction for 45E Turret Mechanics. The existing modules can, with editing, be used in the current program. No material for the module on troubleshooting the XM1 with STE/XM1 test set (enclosed in the rectangle-with-broken lines) is available, nor has any been developed here. That material must be developed by the Army prior to OT II.

The remaining eight modules (without asterisks in Figure 1) are the ones for which we have developed training and test plans. Each of these modules comprises several components, which in turn comprise tasks. The module, 19E Operator Requirements, for example, comprises the components Prepare Gunner's Station for Operation, Perform Pre-operation Checks, and others. The component, Perform Pre-operations Checks, in turn, comprises two tasks: Perform Computer Self-test, and Perform Boresight Check.

The recommended sequence of instruction is from top to bottom in Figure 1. Among the assumptions that were made in the design of the training plans were that:

1. The soldiers to be trained will be naive with respect to the content of the modules, but will have completed BCT.

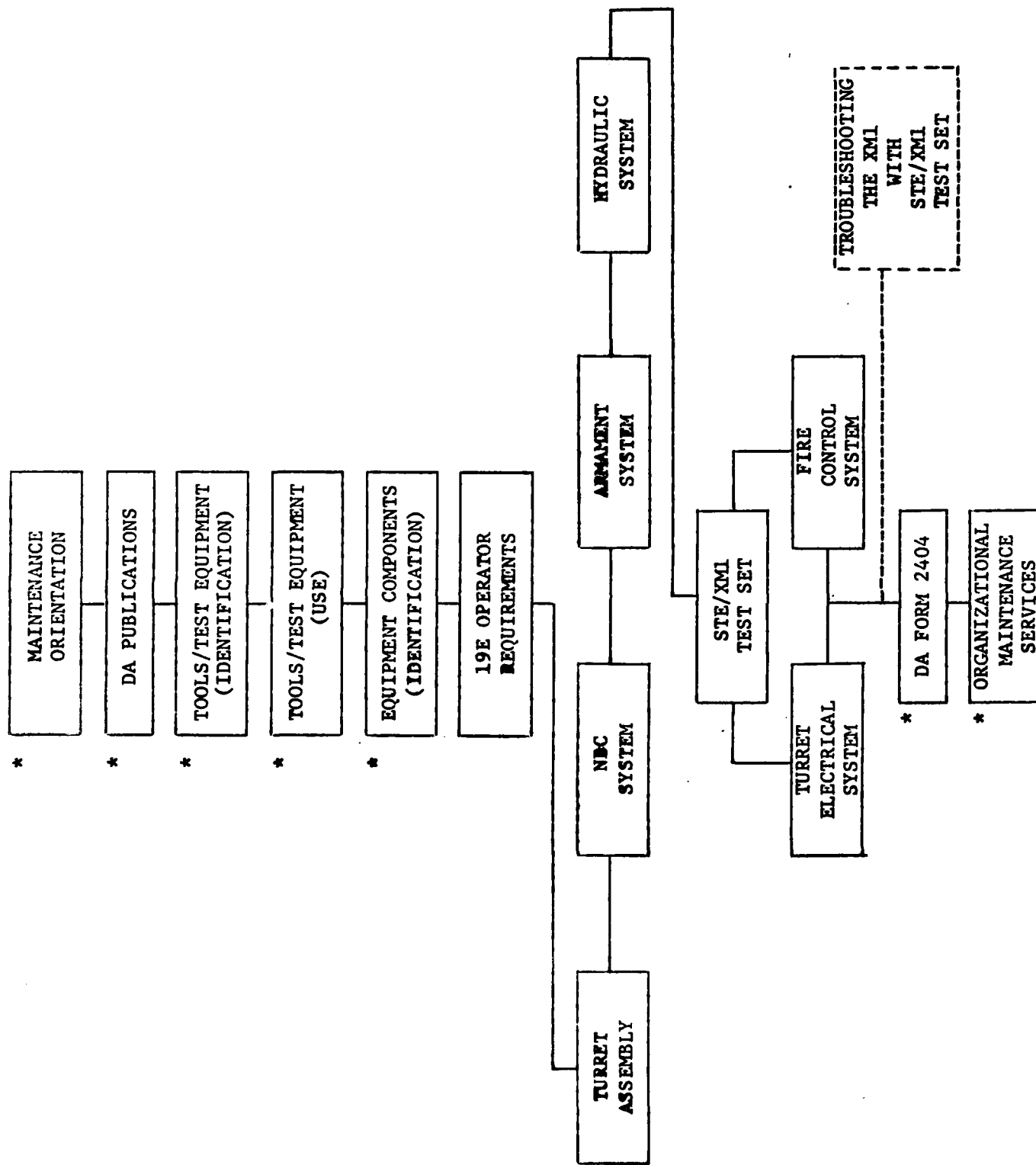


Figure 1. Training concept overview: XM1 45E turret mechanic.

2. Two instructors will be available for every 30 trainees. Training is to be conducted, not as two parallel programs of 15 soldiers each, but as one 30-soldier program with the instructors sharing teaching and testing responsibilities.
3. One device and one XML tank (at a minimum) will be available for each 30-student session.
4. Tasks which can be taught using the TOM-T will be. The XML will be used only for:
 - A. Teaching tasks that cannot be taught using the device.
 - B. End-of-course evaluation testing.

The modules contain measurement specifications, but not tests. Tests should be developed to go with the training using the guidance in Appendix J, Test Development.

Each component outline contains a section entitled "Measurement," which specifies time and accuracy measures to be obtained during and after training. The time measures are in all cases the time between the end of the initiating stimuli (e.g., oral instructions to the mechanic) to which he is expected to respond, and the completion of the desired response. Accuracy standards are given in the component outlines, usually in terms of the extent of correspondence between the task steps performed by the examinee, and the steps in a perfect performance. Each examinee must be remediated during training until he meets the accuracy standard for each component. Examinees are tested, remediated, and retested, so by the end of training, all examinees will have achieved final accuracy scores of 100 percent for each component. This test-remediation-retest procedure is to be used during training only. After training is complete, examinees will receive end-of-course tests for the record, during which no prompting or remediation is to take place. (See Chapter 2, Data Requirements)

Test Participants and Dates¹

The test participants during OT II, and the dates of participation are as follows:

<u>Position</u>	<u>Grade</u>	<u>MOS</u>	<u>Number</u>	<u>Inclusive Dates</u>	<u>Source</u>
Instructors	E5/E6	45N/19E	2	1 Dec 80-17 Apr 81	Weapons Department
Mechanics ²	E2/E3	45E	4	12 Jan 81-17 Apr 81	USAARMS

Tasks for Training

The tasks selected for training are presented here. They are listed under the module and component corresponding to their assignment in the training concept outline. The numbers associated with each module, component, and task for:

- . Turret Assembly
- . NBC System
- . Armament System
- . Hydraulic System
- . Turret Electrical System
- . Fire Control System

correspond to the numbering system used in Task and Skill Analysis Report, Final, for the [XM1] Tank, Combat, Full Tracked 105-MM Gun.³

¹Author. Outline Test Plan, XM1 Turret Organizational Maintenance Trainer TOM-T. 23 January 1979.

²The position "mechanics" is used throughout to refer to the soldiers to be trained during OT II.

³Chrysler Corporation. Task and Skill Analysis Report for the [XM1] Tank, Combat, Full Tracked 105-MM Gun. Author, 1979.

The format for the task list is as follows:

		<u>NUMBER</u>
(MODULE)	<u>TURRET ASSEMBLY</u>	2.15
(COMPONENT)	TURRET LOCK ASSEMBLY	2.15.2
(TASKS)	Inspect turret lock assembly	2.15.2.1
	Replace turret lock assembly handle and spring	2.15.2.5

Tasks marked with an asterisk symbol (*) can be performed on the TOM-T Turret Mock-Up. Those marked with a number symbol (#) can be done on the TOM-T Programmable Maintenance Trainer. Tasks with both an asterisk and a number symbol (*/#) are those which can be performed partially on the turret mock-up and partially on the programmable trainer. Tasks not marked are done on the XM1.

Tasks were selected for training such that each component in the XM1 is represented by at least one task. Components having only one task are represented by that task. Most of the tasks are remove/replace tasks; other tasks (bleed, adjust, service, inspect, purge, test, align) were selected whenever they were available. The task coverage provides practice in using manuals and following procedures. At the same time, the tasks serve as prerequisites to troubleshooting. With the exception of setting-up, testing, and shutting-down the STE/XM1 test set, and troubleshooting the auxiliary hydraulic pump fault symptom, no troubleshooting is included in the program. At the time these materials were prepared, no other troubleshooting documentation was available.

NUMBER

19E OPERATOR REQUIREMENTS

Gunner Tasks

PREPARE GUNNER'S STATION FOR OPERATION	A
Enter Gunner's Station	1A
Perform before-operations maintenance checks and services on Gunner's Station	4A
PERFORM PRE-OPERATION CHECKS	C
Perform computer self-test	3C
Perform boresight check	8C
OPERATE POWER CONTROL HANDLES	F
Traverse turret using power control handles	1F
Elevate/depress main gun using power control handles	2F
MANUALLY INPUT FIRE CONTROL DATA INTO BALLISTIC COMPUTER	G
Manually input fire control data for manual parameters into ballistic computer.	1G
Manually input fire control data for auto parameters into ballistic computer.	2G
OPERATE COAXIAL MACHINEGUN	J
Remove coaxial machinegun	1J
Install coaxial machinegun	2J
BORESIGHT MAIN GUN	K
Boresight Gunner's primary sight	1K
Boresight muzzle reference sensor	2K

Tank Commander Tasks

PREPARE COMMANDER'S STATION FOR OPERATION	A
Operate Commanders hatch	1A
Adjust TC Seat and Platform	2A
Perform before-operations maintenance checks and services on Commander's Station.	4A

	<u>NUMBER</u>
POWER UP COMMANDER'S STATION	B
Operate Commander's power control handle	2B
OPERATE COMMANDER'S MACHINEGUN	C
Clear Commander's Machinegun	1C
<u>Driver Task</u>	
START ENGINE	C
Start Engine-Normal Start	1C

	<u>NUMBER</u>
<u>TURRET ASSEMBLY</u>	2.15
TURRET CORDS	2.15.1
Replace cord assembly	2.15.1.1
TURRET LOCK ASSEMBLY	2.15.2
*Inspect turret lock assembly	2.15.2.1
Replace turret lock assembly handle and spring	2.15.2.5
COMMANDER'S SEAT ASSEMBLY	2.15.3
Replace Commander's seat back recess pad	2.15.3.5
Replace Commander's seat lower platform	2.15.3.9
GUNNER'S SEAT ASSEMBLY	2.15.4
Replace Gunner's seat assembly	2.15.4.2
Replace Gunner's seat back cushion	2.15.4.3
LOADER'S SEAT ASSEMBLY	2.15.5
Replace Loader's platform height adjustment locking pin	2.15.5.16
LOADER'S HATCH ASSEMBLY	2.15.6
Inspect Loader's hatch	2.15.6.1
COMMANDER'S WEAPON STATION HATCH MECHANISM ASSEMBLY	2.15.7
Replace Commander's hatch latching mechanism	2.15.7.2
Replace Commander's unity periscope seal	2.15.7.13
AMMUNITION DOOR ASSEMBLY	2.15.8
Adjust ready ammo door limit switch	2.15.8.4
Adjust roller assemblies	2.15.8.7
Adjust stowage door spring plungers	2.15.8.10
AUDIO FREQUENCY AMPLIFIER MOUNTING BRACKET	2.15.9
Replace audio frequency amplifier mounting bracket	2.15.9.1

	<u>NUMBER</u>
MAINTAIN SAFETY GUARDS AND PADS	2.15.10
Replace spent ammo screen guard magnet	2.15.10.8
TURRET AMMUNITION RACKS	2.15.11
Replace ammo rack plunger	2.15.11.1
Replace ammo tube and hinge	2.15.11.6
TURRET BLOW-OUT PANEL ASSEMBLY	2.15.12
Replace side blow-out panel and frame	2.15.12.1
RADIO ANTENNA MOUNT	2.15.13
Replace receiver/transmitter antenna mount	2.15.13.1
INTERNAL GUN TRAVEL LOCK	2.15.14
*Replace gun elevation lock quick release pin	2.15.14.1
TURRET PLATFORM	2.15.15
*Replace hull-turret slipring cover	2.15.15.1
*Replace turret harness channel cover	2.15.15.2
EXTERNAL STOWAGE BOXES	2.15.16
Replace left exterior stowage box assembly	2.15.16.1

	<u>NUMBER</u>
<u>NUCLEAR, BIOLOGICAL, CHEMICAL (NBC) SYSTEM</u>	2.12
ORIFICE AND HOSE ASSEMBLY	2.12.1
Replace NBC orifice assembly	2.12.1.1
HEATER UNIT	2.12.2
Replace NBC heater units	2.12.2.1
HOSE AND TUBE ASSEMBLY	2.12.3
*Replace NBC slipring tube assemblies	2.12.3.1
NBC FILTER ASSEMBLIES	2.12.4
*Replace NBC gas filters	2.12.4.1

	<u>NUMBER</u>
<u>ARMAMENT SYSTEM</u>	2.18
105 mm GUN MOUNT ASSEMBLY	2.18.1
*Replace 105 mm gun replenisher	2.18.1.3
Align MRS to GPS daylight sight	2.18.1.9
GRENADE LAUNCHER	2.18.2
Replace grenade launcher electrical harness covers	2.18.2.1
LOADER'S WEAPON STATION	2.18.3
*Replace Loader's machine gun mount holder assembly	2.18.3.2
COAXIAL MOUNT	2.18.4
Replace coaxial machinegun solenoid	2.18.4.11
Adjust coaxial machinegun firing solenoid	2.18.4.12
COMMANDER'S WEAPON MOUNT ASSEMBLY	2.18.5
Replace Commander's weapon mount equilibrator	2.18.5.3

	<u>NUMBER</u>
<u>HYDRAULIC SYSTEM</u>	2.7
HYDRAULIC LINES AND FITTINGS	2.7.3
*Replace gun elevation control hydraulic hose assemblies	2.7.3.1
*Replace hydraulic pressure gage hoses and fittings	2.7.3.2
Replace slipping hydraulic lines, hoses, and fittings	2.7.3.3
*Replace hydraulic pressure gage and adapter	2.7.3.8
AZIMUTH SERVO ASSEMBLY	2.7.4
*Replace azimuth servo filter	2.7.4.1
*/#Replace azimuth servo assembly	2.7.4.2
Bleed air from azimuth hydraulic system	2.7.4.3
Check and adjust drift	2.7.4.4
ELEVATION SERVO ASSEMBLY	2.7.5
*Replace elevation servo	2.7.5.1
*Replace elevation servo filter	2.7.5.2
ELEVATION ACCUMULATOR ASSEMBLY	2.7.6
*Replace manual elevation accumulator assembly	2.7.6.1
MANUAL ELEVATION HANDLE PUMP ASSEMBLY	2.7.7
*Replace elevation hand pump handle assembly	2.7.7.1
Bleed air from manual elevation hydraulic system	2.7.7.5
ELEVATION MECHANISM	2.7.8
Replace elevation mechanism struts	2.7.8.1
TRAVERSE GEARBOX ASSEMBLY	2.7.9
Adjust backlash setting	2.7.9.1
TRAVERSE MECHANISM	2.7.10
Service traverse mechanism	2.7.10.2

	<u>NUMBER</u>
HYDRAULIC RESERVOIR	2.7.11
Inspect hydraulic reservoir	2.7.11.2
Replace reservoir sight gage	2.7.11.4
ELECTRICALLY DRIVEN HYDRAULIC PUMP	2.7.12
Troubleshoot auxiliary hydraulic pump fault symptom	2.7.12.3
FILTER MANIFOLD ASSEMBLY	2.7.13
Replace hydraulic filter manifold and fittings	2.7.13.1
RELIEF VALVE AND TUBE ASSEMBLY	2.7.14
Replace hydraulic relief valve and tube assembly	2.7.14.1
MAIN ACCUMULATOR	2.7.15
*Replace main accumulator	2.7.15.1
*Service main accumulator	2.7.15.2
*Replace main accumulator charging valve	2.7.15.4
HYDRAULIC POWER DISTRIBUTION VALVE	2.7.17
*Replace hydraulic power distribution valve	2.7.17.1
AMMUNITION DOOR HYDRAULIC ACTUATOR	2.7.18
*Replace ammunition door hydraulic actuator	2.7.18.1

NUMBER

STE/XMI TEST SET

OPERATION, INSTALLATION, AND REFERENCE DATA

#Set-Up STE/XMI Test Set	1
#Conduct Self-Test	2
#Conduct Adapter Test	3
#Shut-Down STE/XMI Test Set	4

	<u>NUMBER</u>
<u>TURRET ELECTRICAL SYSTEM</u>	2.16
COMMANDER'S CONTROL PANEL	2.16.1
*Replace Commander's control panel indicator lamps or lenses	2.16.1.3
LOADER'S PANEL	2.16.2
*Replace Loader's panel indicator lamps or lenses	2.16.2.3
TURRET NETWORKS BOX	2.16.3
*Replace turret networks box	2.16.3.7
HULL-TURRET SLIPRING UNIT ASSEMBLY	2.16.4
*/#Replace hull-turret slipring	2.16.4.1
BLASTING MACHINE ASSEMBLY	2.16.5
#Test blasting machine	2.16.5.2
*Replace blasting machine	2.16.5.5
TURRET VENTILATION BLOWER ASSEMBLY	2.16.6
*Replace turret vent blower inlet screen	2.16.6.3
CWS AZIMUTH DRIVE ASSEMBLY	2.16.7
*Adjust CWS azimuth drive assembly	2.16.7.1
COMMANDER'S POWER CONTROL UNIT ASSEMBLY	2.16.8
*Replace commander's power control unit	2.16.8.1
ELECTRICAL HARNESS	2.16.9
#Replace electrical harnesses (general instructions)	2.16.9.1
Replace electrical harness 1W101	2.16.9.3
Replace electrical harness 1W204	2.16.9.22
Replace electrical harness 1W305	2.16.9.34
Replace electrical harness 1W314	2.16.9.43

	<u>NUMBER</u>
SWITCH ASSEMBLIES	2.16.10
*Replace zero elevation switch assembly	2.16.10.1
TURRET DOMELIGHT	2.16.11
*Replace domelight rheostat knob	2.16.11.1

	<u>NUMBER</u>
<u>FIRE CONTROL SYSTEM</u>	2.14
GUNNER'S PRIMARY SIGHT ASSEMBLY	2.14.1
*Purge and charge GPS	2.14.1.17
Replace GPS filter/clear/shutter switch	2.14.1.18
Adjust GPS day sight counter rotation scaling	2.14.1.19
*Replace GPS	2.14.1.20
COMMANDER'S GPS EXTENSION ASSEMBLY	2.14.2
*Replace Commander's GPS extension	2.14.2.4
ELECTRONICS RACK ASSEMBLY	2.14.3
*Replace electronics rack jumper assembly (computer electronics units, thermal electronics units, LOS electronics box)	2.14.3.1
*Replace electronics rack shock mounts (floor)	2.14.3.4
LOS ELECTRONICS UNIT	2.14.4
*Replace LOS electronics unit	2.14.4.1
BALLISTIC COVER, HANDLE, AND LINKAGE	2.14.7
Replace GPS ballistic cover door	2.14.7.1
GUNNER'S AUXILIARY SIGHT ASSEMBLY	2.14.8
*Purge and charge GAS	2.14.8.3
*Replace GAS panel reticle power switch	2.14.8.7
COMMANDER'S WEAPON STATION SIGHT ASSEMBLY	2.14.9
*Purge and charge CWS sight	2.14.9.3
COMPUTER ELECTRONICS UNIT ASSEMBLY	2.14.10
*/#Replace computer electronics unit (CEU)	2.14.10.1
COMPUTER CONTROL PANEL	2.14.11
*Replace computer control panel (CCP)	2.14.11.3

	<u>NUMBER</u>
GUN TURRET DRIVE ELECTRONICS UNIT	2.14.12
*Replace gun turret drive electronics unit	2.14.12.2
CROSSWIND SENSOR	2.14.13
*Replace crosswind sensor	2.14.13.3
CANT ASSEMBLY	2.14.14
*Replace cant unit	2.14.14.2
RATE GYROSCOPE ASSEMBLIES	2.14.15
Replace hull gyroscope	2.14.15.1
GUNNER'S HANDLE ASSEMBLY	2.14.16
*Replace Gunner's control handle assembly	2.14.16.1
LASER RANGEFINDER	2.14.17
*Purge and charge laser rangefinder	2.14.17.3
THERMAL IMAGING SYSTEM	2.14.18
Clean TIS image control unit optical surface	2.14.18.6
REMOTE THERMOMETER	2.14.19
Replace remote thermometer	2.14.19.1
LOADER'S UNITY PERISCOPE	2.14.20
Replace Loader's periscope mirror mount assembly	2.14.20.1
COMMANDER'S CONTROL HANDLE	2.14.22
*//Replace Commander's control handle assembly	2.14.22.1
CWS MANUAL ELEVATION DRIVE	2.14.24
Replace CWS cable assembly and lever	2.14.24.2

Training Materials

The training materials for each module are presented in Appendixes A through H as:

Appendix A	19E Operator Requirements
Appendix B	Turret Assembly
Appendix C	NBC System
Appendix D	Armament System
Appendix E	Hydraulic System
Appendix F	STE/XML Test Set
Appendix G	Turret Electrical System
Appendix H	Fire Control System

The materials for each module are organized into three main parts:

Part 1	Lesson Plan Outline
Part 2	Component Outline
Part 3	Task Analysis Outline

Lesson Plan Outline.¹ The lesson plan outline is written for the entire module and includes the following sections:

- A. Training Objective for the module to include the task, conditions, and standard.
- B. Intermediate Training Objective (ITO) for the module. This is currently described as (None) but some ITO may be included by the developer when the entire training program is completed.
- C. Administrative Instructions for conducting the training. The information for each heading to be provided by the developer.
- D. Sequence for conducting the training and testing.²
- E. Safety Instructions for the module. This is currently not described, but any specific, non-traditional safety requirements should be described.
- F. Additional Comments and Information specific to each module.

A sample Lesson Plan Outline for the Turret Assembly module is at Figure 2.

Component Outline. The component outline includes the:

- A. Module of which the component is a part.
- B. Component as described in Task and Skill Analysis Report, Final, [XML] for the Tank, Combat, Full Tracked 105-MM Gun.

¹Basic principles of and guidance for performance-oriented instruction are at Appendix I.

²A discussion on test development and some performance test examples are at Appendix J.

LESSON PLAN OUTLINE

TURRET ASSEMBLY

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 24 tasks in the Turret Assembly module.

CONDITIONS: As described in the PRELIMINARY and FOLLOW ON PROCEDURES.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the mechanic and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

Figure 2. Sample lesson plan outline for the turret assembly module.

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The procedures described under MECHANIC WILL for each task are derived from Task and Skill Analysis Report, Final, [XM1] for the Tank, Combat, Full Tracked 105-MM Gun. Chrysler Corporation, 1979. There is a possibility that the procedures have changed with design changes in the XM1. The procedures should be updated for the XM1 based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XM1 procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

Figure 2 (Cont'd.). Sample lesson plan outline for the turret assembly module.

¹Boldovici, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

- C. Performance Outcomes listing the task(s) to be trained in the component and the end of training performance time. (No times are given for the tasks in the 19E Operator Requirements module as the times have not yet been established.)
- D. Measurement specifications for each task. (These are presented in the Task Analysis Outline for the 19E Operator Requirements Module).

A sample component outline for the traverse gearbox assembly is at Figure 3.

Task Analysis Outline. The task analysis outline for each task in the program¹ includes:

- A. Task number and title.
- B. Parts (new/replacement) to do the task.
- C. Tools to do the task.
- D. Expendables required on hand to do the task.
- E. Preliminary Procedures to assist the developer/trainer/instructional personnel in identifying conditions for performing the task. These are not considered part of the task and parts, tools, expendables, and time does not pertain to them.
- F. Mechanic Will describes the responses to be measured, and includes, as Notes, any information that will enhance task performance.
- G. Follow On Procedures to be performed after the last step in "Mechanic Will." During training these should not be done.
- H. References indicates the documents and pages where the task description was found by the developers of Task and Skill Analysis Report, Final, [XML] for the Tank, Combat, Full Tracked 105-MM Gun.

¹The discussion regarding the task analysis outline applies to the tasks for components in Appendixes B, C, D, E, G and H. The formats in Appendixes A and F are different. The format for Appendix A includes four parts, as follows:

- 1. Conditions/Stimulus
- 2. Action
- 3. Measurement
- 4. References

The format in Appendix F is merely the task description provided in TM 9-4910-572-146P.

- I. Time is for performing the activities under "Mechanic Will" and represents an initial time estimate taken from either maintainability analysis reports whenever possible or the experience of TASA developers. The times should be verified during the instructor training phase for the OT.

A sample task analysis outline for adjust backlash setting is at Figure 4.

Publications

A list of the publications required to conduct the training is presented in Table 1.

TABLE 1

XMI EQUIPMENT PUBLICATIONS

The following publications are necessary for conducting training:

<u>PUBLICATION</u>	<u>TITLE</u>	<u>VOLUME</u>
TM9-2350-255-10-1	Operator's Manual	-----
TM9-2350-255-10-2	Operator's JPG	-----
LO9-2350-255-12	Lubrication Order	-----
TM9-2350-255-21-1-1	Organizational Maintenance (Hull)	I - Scheduled Maintenance
TM9-2350-255-21-1-2	Troubleshooting (Hull)	II - Troubleshooting
TM9-2350-255-21-1-3-1	Organizational Maintenance (Hull)	III - Maintenance
TM9-2350-255-21-1-3-2	Organizational Maintenance (Hull)	III - Maintenance
TM9-2350-255-21-1-3-3	Organizational Maintenance (Hull)	III - Maintenance
TM9-2350-255-21-1-3-4	Organizational Maintenance (Hull)	III - Maintenance
TM9-2350-255-21-1-3-5	Organizational Maintenance (Hull)	III - Maintenance
TM9-2350-255-20-1-4	Organizational Maintenance (Hull)	IV JPG
TM9-2350-255-20-2-1	Organizational Maintenance (Turret)	I - Scheduled Maintenance
TM9-2350-255-20-2-2	Troubleshooting (Turret)	II - Troubleshooting
TM9-2350-255-20-2-3-1	Organizational Maintenance (Turret)	III - Maintenance
TM9-2350-255-20-2-3-2	Organizational Maintenance (Turret)	III - Maintenance
TM9-2350-255-20-2-4	Organizational Maintenance (Turret)	IV - JPG
TM9-4910-572-14&P	Test Set, STE/XMI	I - Operation, Installation, and Reference Data

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Traverse Gearbox Assembly (2.7.9)

PERFORMANCE OUTCOMES:

Mechanic will:

2.7.9.1 Adjust backlash setting. (6 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task. Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements. Accuracy - As indicated by:

Task 2.7.9.1 a. Adjusting screw tightened six or seven turns beyond contact point. (See NOTE A on task sheet).

Figure 3. Sample component outline for the traverse gearbox assembly.

TASK 2.7.9.1 ADJUST BACKLASH SETTING

PARTS:	None
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive, 3 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Remove cover from traverse gearbox by hand.
2. Loosen adjusting screw to the left using socket, extension, and handle.

NOTE A: The contact point is when the anti-backlash pinion contacts the turret drive ring. Contact point will be indicated when adjusting screw suddenly gets harder to turn.

3. Turn adjusting screw right to contact point using socket, extension, and handle.
4. Tighten adjusting screw six or seven more turns after contact point is reached.
5. Put cover on traverse gearbox.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-34-2-2-1; p. 2-54.

TIME:

6 Minutes

Figure 4. Sample task analysis outline for
adjust backlash setting.

CHAPTER 2

DATA REQUIREMENTS

In order to evaluate the effectiveness of this maintenance training program, data will be needed in three areas:

- . Training resource requirements (Issue 2.2.4)
- . End of training qualification testing
(Training effectiveness) (Issue 2.2.2)
- . Job performance evaluation (Training transfer)
(Issue 2.2.3)

Training Resource Requirements

This information will be used to estimate the cost of developing and implementing the training program. The forms provided in Appendix K should be used to report the information. Explanations of the entries for each are as follows.

Personnel Requirements. This form should be completed for each person who is involved in setting up or running any part of the maintenance training program. They may have been involved in administrative details and logistics of the program (Planning), in the writing and review of written materials to be used in running the program (Development), in the actual running of the program as instructor, assistant, or test administrator (Conduct), or in the evaluation phase of the end of course testing, conducted on the XML for tasks trained on the TOM-T (Evaluation). (This evaluation phase is explained in greater detail below.) For each of these four functions in which the person worked, indicate whether he filled a primary role, directing or responsible for major areas of work, or whether he was in a support position, assisting or under the supervision of someone in the primary role. The number of hours the person spent on each function should also be noted.

Equipment Use. This form contains a list of all expendable items projected to be required for conduct of the maintenance training program. For each item, the instructor should use the form to record the quantity expended. If other items are required, they should be added to the list, and the module and task for which they are required should be noted.

Training Report. This form will be used to record the instructor and mechanic time required for training each task. The date and time when the instructor demonstrates the task to the mechanics should be recorded. After the demonstration, the instructor will conduct a walk-through of the task and supervise practice of the task for each mechanic (see Appendix I). When the mechanic and the instructor feel that the mechanic is able to perform the task, he should be tested. (Tests of tasks trained on the TOM-T Turret Mock-Up and the XML tank should be constructed according to principles in Appendix J. Tests of tasks trained on the TOM-T Programmable Maintenance Trainer will be conducted using the device Test Mode.) If the mechanic does not perform the task to the training standard, the instructor should remediate the mechanic (on the TOM-T Programmable Maintenance Trainer, switch to Practice Mode) and then conduct the test again. When the mechanic performs the task to the training standard, the instructor should note the date, time, and number of test attempts on the Training Report. (For tasks trained on the TOM-T Programmable Maintenance Trainer, a printout of the mechanic's test trials should be obtained and kept for record; number of attempts may be read from the printout.)

End of Training Qualification Testing (Training Effectiveness)

In order to determine whether mechanics are qualified at the end of training, and in order to measure the effectiveness of the training, end of training tests will be administered to all mechanics. The end of training tests for tasks trained on the TOM-T Turret Mock-Up and XM1 tank will be selected from among the tests developed for during training testing. For task trained on the TOM-T Programmable Maintenance Trainer, the device Test Mode will be used. The following guidelines should be followed in selecting the tests to be used:

1. A minimum of forty (40) tests should be selected.
2. Ten (10) of the tests should be for tasks that were trained and are to be tested solely on the TOM-T Programmable Maintenance Trainer. (Note: No more than three malfunctions should be induced for any task, and the malfunctions should be noted for use in Job Performance Evaluation testing.)
3. Ten (10) of the tests should be for tasks that were trained and are to be tested solely on the TOM-T Turret Mock-Up.
4. Ten (10) of the tests should be for tasks that require the use of both of the TOM-T devices. If there are not sufficient such tasks, these tests should be selected from among those that require either of the two devices (paragraphs 2 and 3).
5. Ten (10) of the tests should be for tasks that were trained and are to be tested solely on the XM1 tank.
6. At least three tests should be selected from each of the eight maintenance modules and the trouble-shooting module.
7. The tests selected should be varied from class to class; at least 10 tests for each class should not have been used for qualification of the previous class.
8. If you or someone else wants to test any additional tasks, you may do so. The criteria in paragraphs 1-7 are minimum selection criteria.

9. The mechanics should not be informed of which tests are to be used for end of training qualification.

As with the during training tests, when a mechanic cannot perform a step of the task, the instructor should coach him in correct performance. Again, the mechanic makes as many attempts as needed to perform the test to the standard without coaching. The instructor should use the End of Training Report Form to record number of attempts. He should also make a note of any steps for which the mechanic required coaching, on any and all attempts of the test.

For tasks trained on the TOM-T Programmable Maintenance Trainer, the test is again administered in the device Test Mode. The instructor should switch the device to Program Mode when the mechanic requires coaching. A printout of the mechanics test trials should be obtained and kept for record; number of attempts and steps requiring coaching may be read from the printout.

Job Performance Evaluation (Training Transfer)

The purpose of the evaluation phase of the training program is to determine the extent to which learning on the TOM-T devices is associated with performance on the XML tank itself. In order to measure the degree of transfer, the job performance evaluation will consist of tests administered on the XML. The tests to be used are the ones selected for qualification testing for those tasks trained solely on the TOM-T devices (paragraphs 2, 3, and 4 of the preceding section; minimum of 30 tests).

The evaluation testing is similar to both the during training and the end of training testing. Again, the same test conditions and scoresheets are used. Mechanics are allowed only one attempt, but may be coached on any performance measure. If coaching is necessary, the performance measure is marked with a "C" in the Fail column of the scoresheet.

At the conclusion of the test, the instructor or test administrator should mark on the End of Training Report in the XM1 column a GO for the test if the mechanic performed the test to the end of training standard. If the mechanic fails any performance measures, the test administrator should note which performance steps required coaching or were failed but not coached. Note that these results are not used for qualification purposes. The graded scoresheets, marked "XM1" at the top, should be attached to the End of Training Report.

APPENDIXES

Page

A	19E OPERATOR REQUIREMENTS	A-1
B	TURRET ASSEMBLY	B-1
C	NBC SYSTEM	C-1
D	ARMAMENT SYSTEM	D-1
E	HYDRAULIC SYSTEM	E-1
F	STE/XM1 TEST SET	F-1
G	TURRET ELECTRICAL SYSTEM	G-1
H	FIRE CONTROL SYSTEM	H-1
I	PERFORMANCE-ORIENTED INSTRUCTION	I-1
J	TEST DEVELOPMENT	J-1
K	TRAINING RESOURCE REQUIREMENT FORMS	K-1
L	PREREQUISITE KNOWLEDGES AND SKILLS.	L-1

APPENDIX A

19E OPERATOR REQUIREMENTS

LESSON PLAN OUTLINE

19E OPERATOR REQUIREMENTS

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 18 tasks in the 19E Operator Requirements module.

CONDITIONS: See CONDITIONS/STIMULUS for each task.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through practice session by having mechanics demonstrate each task. Circulate among the students and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The tasks in this module are tank operator tasks which are pre-requisite for doing the maintenance tasks that follow. As such, it is mandatory that each mechanic be proficient on these tasks.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Action. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The tasks in this module are numbered according to the numbering system used in Development of Training Objectives for XMI UCFT.² The task analysis outline for each task in this module is taken directly from the referenced work.

¹Boldovici, J.A., Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

²Harris, J.H., Campbell, C.H., Kraemer, R.E., and Bessemer, D.W. Development of Training Objectives for XMI UCFT. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Working Paper, 1980.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

19E Operator Requirements

COMPONENT:

Prepare Gunner's Station for Operation

PERFORMANCE OUTCOMES:

Mechanic will:

- 1A Enter Gunner's station.
- 4A Perform before operations maintenance checks and services on Gunner's station.

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 1A: ENTER GUNNER'S STATION

CONDITIONS/STIMULUS

System State: Table A, Column 1A; and, hatches closed and secure, and keys for hatch padlocks.

Gunner Location: Outside tank.

Initiating Stimuli: TC tells Gunner to prepare station for operation.

ACTION

- Gunner will:**
1. Mount tank using step on left forward skirt panel and handhold.
 2. Unlock padlock on Loader's hatch.
 3. Grab handle on hatch and move hatch to full open position.
 4. Move hatch toward closed position to check that hatch-open lock is hooked.
 5. Enter tank through Loader's hatch, stepping on Loader's seat, then down to turret floor.
 - 6a. Turn VEHICLE MASTER POWER switch on Commander's control panel ON by pulling switch out and raising to ON position.
 - 6b. Turn TURRET POWER switch on Commander's control panel ON.
 7. Check that VEHICLE MASTER POWER light and TURRET POWER light on Commander's control panel come on.
 8. Verify that VEHICLE MASTER POWER light on Driver's master panel comes ON.
 9. Release VEHICLE MASTER POWER switch.

NOTE A: Switch returns to center position.

10. Turn domelight lever to white light (for day operations) by moving lever away from red mark on domelight housing; or, to red light (for night operations) by moving lever toward red mark on domelight housing.
11. Turn domelight knob clockwise to increase light or counterclockwise to decrease or shut off light.

NOTE B: Perform Steps 12, 13, 14, 15 if rest of crew is in the tank.

12. Step up on Loader's seat.
13. Grasp hatch-closed latch handle.
14. Pull hatch-open lock handle forward and pull hatch closed while stepping down from seat.
15. Turn hatch-closed latch handle to LOCKED position.

TABLE A

POSITION OF CONTROLS FOR GUNNER TASKS
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS											
	TASKS											
	1A	4A	3C	8C	1F	2F	1G	2G	1K	2K	1J	2J
Computer panel power switch	OFF	OFF	ON	ON	OFF	OFF	ON	ON	ON	ON		
GUN SELECT switch	TRIGGER SAFE	TRIGGER SAFE	TRIGGER SAFE	TRIGGER SAFE	TRIGGER SAFE	TRIGGER SAFE	TRIGGER SAFE	MAIN OR COAX	TRIGGER SAFE	MAIN OR COAX	TRIGGER SAFE	TRIGGER SAFE
GUN/TURRET DRIVE switch	MANUAL	MANUAL	POWERED	POWERED	POWERED	POWERED	POWERED	POWERED	POWERED	POWERED	MANUAL	MANUAL
RF RANGE switch	SAFE	SAFE	SAFE	SAFE	SAFE	SAFE	SAFE	SAFE	SAFE	SAFE	SAFE	SAFE
Ballistic door/handle	CLOSED	OPEN OR CLOSED	OPEN/ DAYLIGHT	OPEN/ DAYLIGHT	OPEN OR CLOSED	OPEN OR CLOSED	OPEN OR CLOSED	OPEN OR CLOSED	OPEN/ DAYLIGHT	OPEN/ DAYLIGHT	OPEN OR CLOSED	OPEN OR CLOSED
Elevation travel lock	LOCKED	LOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	LOCKED	LOCKED
Turret traverse lock	LOCKED	LOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	UNLOCKED	LOCKED	LOCKED
Turret power switch	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
VEHICLE MASTER POWER switch	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
FIRE CONTROL MODE switch			NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	EMER	NORMAL	NORMAL
THERMAL MODE switch			STANDBY	STANDBY					STANDBY	STANDBY		
COAX MANUAL SAFETY switch											S	S

MEASUREMENT

During Training:

Time - Between end of initiating stimuli and completion of Step 11 (or Step 15 if rest of crew is in tank). ...

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training:

Time - Between end of initiating stimuli and completion of Step 11 (or Step 15 if rest of crew is in tank).

Accuracy - As indicated by:

- . VEHICLE MASTER POWER lights ON.
- . Domelight ON.
- . Turret domelight lever on whitelight for day operations or red light for night operations.
- . Loader's hatch-closed latch handle LOCKED (if rest of crew is in tank).

REFERENCES

DEP 9-2350-255-10-1; p. 2-111, p. 2-63.
DEP 9-2350-255-10-2; pp. 2-27 to 2-29.

**TASK 4A: PERFORM BEFORE-OPERATIONS MAINTENANCE CHECKS
AND SERVICES ON GUNNER'S STATION**

CONDITIONS/STIMULUS

System State: Table A, Column 4A; and, an operational radio intercommunications system, Gunner and TC CVC helmets, a predetermined frequency set on the radio, gas mask M25A1, TM 9-2350-255-10-1, and DA Form 2404.

Gunner Location: In Gunner's station.

Initiating Stimuli: Task 3A is completed.

ACTION

- Gunner will:**
1. Adjust Gunner's seat, browpads, and chest-rest (see Task 2A).
 2. Check seat cushion for rips and tears.
 3. Operate intercommunications equipment (see Task 3A).
 4. Check Manual Gun/Turret Controls as follows:
 - a. Tell Loader to unlock turret traverse lock.
 - b. Unlock main gun elevation travel lock as follows:
 1. Press button on end of lock pin.
 2. Remove lock pin from lock pin holes on main gun breech.
 3. Swing elevation strut to turret roof.
 4. Lock elevation strut to turret roof with lock pin.

NOTE A: GUN TURRET DRIVE switch must be in MANUAL before unlocking or locking elevation travel lock.

- c. Turn AUX HYDR POWER switch to ON and check that hydraulic pressure gage stays between 1550 and 1650 psi.
- d. Elevate and depress main gun with manual elevation crank handle as follows:
 1. Look into GPS eyepiece.
 2. Turn FLTR/CLEAR/SHTR switch to FLTR or CLEAR.
 3. Grasp and squeeze manual elevation crank handle, depressing palm switch.
 4. Rotate manual elevation crank handle clockwise to elevate gun; counterclockwise to depress gun.
- e. Traverse turret right and left with manual traverse crankhandle as follows:
 1. Look into GPS eyepiece.
 2. Grasp and squeeze manual traverse crank handle clockwise to traverse turret to right; counterclockwise to traverse turret to left.

NOTE B: Manual traverse crank handle wheels when palm lever is released.

- f. Check all visible hydraulic lines for leaks.
- g. Check azimuth and elevation servo mechanisms filter pop-up buttons (only if popped out) as follows:
 - 1. Push pop-up buttons.
 - 2. Traverse turret and elevate main gun (see Task 4A, Steps 4d and 4e).
 - 3. Notify Tank Commander if either button pops out again.
- h. Lock main gun elevation lock as follows:
 - 1. Move main gun breech until elevation lock aligns with locking pin holes on breech.
 - 2. Push button on lock pin and push lock pin through breech and strut holes.
- i. Tell Loader to lock turret traverse lock.
- j. Turn AUX HYDR POWER switch to OFF.
- 5. Check Gunner's Gas Particle Filter Equipment as follows:
 - a. Take breakaway socket of air hose from mount by Gunner's seat.
 - b. Connect hose to canister of protective mask, M25A1.

NOTE C: GAS PARTICLE FILTER switch on Driver's master panel must be ON.

- c. Turn air heater ON.

NOTE D: Air heater light should come on.

- d. Regulate air temperature with air heater control knob until comfortable air temperature is reached.
- e. Mask and check operation of filter, hose, and connector.
- f. Check microphone operation (see Task 3A).
- g. Unmask and turn air heater OFF.
- h. Disconnect hose from mask and connect breakaway socket to mount.
- i. Stow protective mask.
- 6. List any uncorrected deficiencies on DA Form 2404.

MEASUREMENT

During Training:

Time - Between end of the firing stimuli and completion of Step 5 (or 6 if uncorrected deficiencies are found).
Accuracy - As indicated by match between steps given above and steps performed by Gunner.

Time - Between end of initiating stimuli and
completion of Step 5 (or 6 if uncor-
rected deficiencies are found).
End of Training:
Accuracy - As indicated by:
 . Deficiencies corrected or listed on
 operator portion of DA Form 2404.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-47 to 2-49, p. 2-141, p. 2-148, p. 2-149,
p. 2-167, p. 2-88.
Job Data Work Sheet No. PB127159.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

19E Operator Requirements

COMPONENT:

Perform Pre-Operation Checks

PERFORMANCE OUTCOMES:

Mechanic will:

3C Perform computer self test.

8C Perform boresight check.

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 3C: PERFORM COMPUTER SELF TEST

CONDITIONS/STIMULUS

System State: Table A, Column 3C.
Gunner Location: In Gunner's station.
Initiating Stimuli: Task 2C completed.

ACTION

- Gunner will:
1. Insure hydraulic pressure gage reads 1550 to 1650 psi.
 2. Insure turret traverse lock is unlocked.
 3. Insure main gun elevation travel lock is unlocked.
 4. Have Loader insure GUN/TURRET DRIVE switch is set to POWERED (light is lit).
 5. Insure FIRE CONTROL MODE switch is set to NORMAL (light is lit).
 6. Insure stabilization drift is nulled out (see Task 2B, Steps 8 & 9).
 7. Insure computer power switch is set to ON (PWR light is lit).

NOTE A: Computer power must be on for 90 seconds before starting computer self test.

8. Squeeze and hold power control handle palm switch throughout self test.

NOTE B: Do not move Gunner's or TC's control handles during self test.

9. Push and release TEST button on computer panel.

NOTE C: TEST button will light and remain lit throughout self test. If computer will not perform self test (TEST light does not light), continue with Step 10.

NOTE D: Self test will stop if palm switch is released. After releasing palm switch, self test may not be continued, but may be started over (Step 8).

NOTE E: If TEST light goes out, and display panel reads PASS, self test is completed with no failures encountered.

NOTE F: If a failure is encountered during the self test, the NO GO light (red) will light, and the display panel will read FAIL (flashing) for 4 seconds. Then a failure number will appear in the display for 10 seconds. The self test will stop.

If an AUTO INPUT key (CROSSWIND, CANT, LEAD, or RANGE) is lit and flashing, continue with Step 11.

If no keys are flashing, continue with Step 13.

10. If computer will not perform self test, take corrective action as follows:
 - a. Perform checks in Steps 5, 7, and 8 again.
 - b. If computer display panel shows numbers, press ENTER key.
 - c. Insure turret cables are connected.
 - d. Insure circuit breaker on panel in turret networks box is set to ON.

NOTE G: After taking corrective action, begin self test again (Step 8). If self test still does not run, notify organizational maintenance.

11. To bypass failed AUTO INPUT component and continue self test:
 - a. Push and release flashing AUTO INPUT key.

NOTE H: Key will remain lit, not flashing. Display value will be 0 (zero) for cant, crosswind, or lead failures; display will show battle range value for range failure.

- b. Press ENTER key.

NOTE I: Input to computer from failed component is cancelled, and self test continues. After self test is completed, take corrective action (Step 12). To return to automatic input for component, press lighted AUTO INPUT key.

12. For AUTO INPUT failures, discontinue self test and take corrective action as follows:

- a. Failure 2 - Cant sensor.
 - 1) Insure tank is on level ground.
 - 2) Insure cant sensor cables are connected.
- b. Failure 3 - Crosswind sensor.
 - 1) Insure crosswind sensor cables are connected.
 - 2) Check crosswind sensor (see Task 10C).
 - 3) Cover crosswind sensor during test if wind is gusting.
- c. Failure 4 - Lead (Azimuth rate).
 - 1) Insure hydraulic pressure gage reads 1550-1650 psi.
 - 2) Insure turret traverse lock is unlocked.
 - 3) Insure stabilization drift (azimuth) is nulled out.
 - 4) Insure gunner's and IC's control handles were not moved during self test.
 - 5) Insure GUN/TURRET DRIVE POWERED light is lit.
 - 6) Insure FIRE CONTROL MODE NORMAL light is lit.

- d. Failure 8 - Range (laser rangefinder).
 - 1) Insure LRF RANGE switch is set to SAFE.
 - 2) Insure LRF buttons on gunner's and TC's control handles were not pressed during self test.
 - 3) With LRF RANGE switch set to SAFE, turn TURRET POWER switch to OFF and back to ON to reset laser.

NOTE J: After taking corrective actions, begin self test again (Step 8). If failure still appears, notify organizational maintenance. Input data manually as required (see Task 2G).

- 13. For computer failures (other than AUTO INPUT) take corrective action as follows:
 - a. Failure 1 - Computer.
 - 1) Enter AMMO TEMP (see Task 1G) and repeat self test.
 - 2) If failure 1 occurs again, enter all manual inputs (Task 1G) and recharge computer battery by leaving TURRET POWER switch set to ON for one hour.
 - b. Failure 5 - Sight stabilization (elevation rate).
 - 1) Insure main gun elevation travel lock is unlocked.
 - 2) Insure stabilization drift (elevation) is nulled out.
 - 3) Insure gunner's and TC's control handles were not moved during self test.
 - 4) Insure GUN/TURRET DRIVE POWERED light is lit.
 - 5) Insure FIRE CONTROL MODE NORMAL light is lit.
 - c. Failure 6 - GPS reticle servo.
 - 1) Inform TC of failure.
 - d. Failure 7 - Data link (sight-gun link).
 - 1) Insure main gun is at least 3 degrees away from maximum depression/elevation.
 - 2) Insure palm switches were released after previous self test.
 - 3) Insure turret traverse and gun elevation locks are unlocked.
 - 4) Insure GUN/TURRET DRIVE POWERED light is lit.
 - 5) Insure FIRE CONTROL MODE NORMAL light is lit.
 - 6) With FIRE CONTROL MODE set to EMER, if stabilization drift occurs (see Task 2B, Step 8), notify organizational maintenance.

NOTE K: After taking corrective action(s) run self test again (Step 8). If same failure still appears, notify organizational maintenance.

MEASUREMENT

During Training:

Time - Between end of initiating stimulus and completion of Step 9 (after corrective action(s) taken as required).

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training:

Time - Between end of initiating stimulus and completion of Step 9 (after corrective actions taken as required).

Accuracy - As indicated by:

- . Before self test is started (Step 8):
 - Hydraulic pressure gage reads 1550-1650 psi.
 - Turret traverse and main gun elevation locks are unlocked.
 - GUN/TURRET DRIVE POWERED light is lit.
 - FIRE CONTROL MODE NORMAL light is lit.
 - Stabilization drift (azimuth and elevation) is nulled out.
 - Computer PWR light is lit for 90 seconds.
- . Self test ends with no failures encountered,
or . After corrective actions are taken, components still failing self test are reported to organizational maintenance.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-123 to 2-125, p. 3-18, pp. 3-20 to 3-22.

TASK 8C: PERFORM BORESIGHT CHECK

CONDITIONS/STIMULUS

System State: Table A, Column 8C; and, a boresight target at a range near 1200 meters, and a muzzle borescope inserted in main gun muzzle so that top and bottom witness marks on gun muzzle are aligned with marks on borescope, and eyepiece is on right of gun tube.

Gunner Location: In Gunner's station.

Initiating Stimuli: Task 7C is completed.

ACTION

- Gunner will:**
1. Turn GUN SELECT switch to MAIN.
 2. Turn FIRE CONTROL MODE switch to EMER.
 - 3a. Insert 1200 meters range into computer manually (see Task 2G).
 - or 3b. Insert 1200 meters range by lasing on target (see Task).
 4. Press BORESIGHT key on computer control panel.
 5. Turn FLTR/CLEAR/SHTR switch to FLTR or CLEAR.
 6. View through GPS eyepiece and lay borescope reticle dot on clearly defined point on target by laying gun from low to high and from left to right.

NOTE A: Do not overshoot and return.

7. Verify that GPS and borescope reticles are ± 0.3 mils.

NOTE B: Complete GPS boresight procedure (see Task 1K) and boresight muzzle reference sensor (see Task 2K) if GPS and borescope reticles are not ± 0.3 mils.

8. Turn GUN SELECT switch to TRIGGER SAFE.
9. Turn FIRE CONTROL MODE switch to NORMAL.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 9.

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training: Time - Between end of initiating stimuli and completion of Step 9.

Accuracy - As indicated by GPS and borescope reticles ± 0.3 mils.

REFERENCES

DEP 9-2350-255-10-1; p. 2-130, pp. 2-158 to 2-159.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

19E Operator Requirements

COMPONENT:

Operate Power Control Handles

PERFORMANCE OUTCOMES:

Mechanic will:

1F Traverse turret using power control handles.

2F Elevate and depress main gun using power control handles.

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 1F: TRAVERSE TURRET USING POWER CONTROL HANDLES

CONDITIONS/STIMULUS

System State: Table A, Column 1F.
Gunner Location: In Gunner's station.
Initiating Stimuli: Tank Commander tells Gunner to traverse turret 90° in either direction and in opposite direction until gun tube is centered over front deck, using power control handles.

ACTION

- Gunner will:
1. Grasp power control handles and squeeze either or both power control handle palm switches.
 2. With palm switches squeezed, turn power control handles to traverse turret.

NOTE A: Turret traverses clockwise while handles are turned clockwise of center position; turret traverses counterclockwise while handles are turned counterclockwise of center position.

NOTE B: Traversing speed increases as handles are turned further and slows as handles are turned toward center position.

NOTE C: Releasing palm switches causes turret to stop moving. When power control handles are released, handles return to center position.

MEASUREMENT

During Training:

Time - Between end of initiating stimuli and return of gun tube to center position over front deck.

Accuracy - As indicated by match between steps given above and actions performed by Gunner.

End of Training:

Time - Between end of initiating stimuli and return of gun tube to center position over front deck.

Accuracy - As indicated by:

- . Turret is traversed at least 90° either direction.
- . Turret is traversed opposite direction until gun is centered over front deck.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-141 to 2-143.

TASK 2F: ELEVATE AND DEPRESS MAIN GUN USING POWER CONTROL HANDLES

CONDITIONS/STIMULUS

System State: Table A, Column 2F.
Gunner Location: In Gunner's station.
Initiating Stimuli: Tank Commander tells Gunner to elevate main gun 10° above zero elevation, depress main gun 10° below zero elevation, and return main gun to zero elevation, using power control handles.

ACTION

Gunner will: 1. Grasp power control handles and squeeze either or both power control handle palm switches.
2. With palm switches squeezed, rotate power control handles to elevate or depress main gun.

NOTE A: Main gun is elevated while power control handles are rotated toward gunner; main gun is depressed while handles are rotated away from gunner.

NOTE B: Rate of movement of main gun increases as handles are rotated further and slows as handles are rotated toward center position.

NOTE C: Releasing palm switches causes main gun to stop moving. When power control handles are released, handles return to center position.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and return of gun tube to zero elevation.
Accuracy - As indicated by match between steps given above and actions performed by Gunner.

End of Training: Time - Between end of initiating stimuli and return of gun tube to zero elevation.
Accuracy - As indicated by:
• Gun is elevated a minimum of 10° above zero elevation.
• Gun is depressed a minimum of 10° below zero elevation.
• Gun is returned to zero elevation.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-141 to 2-143.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

19E Operator Requirements

COMPONENT:

Manually Input Fire Control Data Into Ballistic Computer

PERFORMANCE OUTCOMES:

Mechanic will:

- 1G Manually input fire control data for manual parameters into ballistic computer.
- 2G Manually input fire control data for auto parameters into ballistic computer

MEASUREMENT:

As described for each task on Task Analysis Outline.

**TASK 1G: MANUALLY INPUT FIRE CONTROL DATA FOR MANUAL
PARAMETERS INTO BALLISTIC COMPUTER**

CONDITIONS/STIMULUS

System State: Table A, Column 1G; and, Task 3C
completed, and information for manual inputs
provided.

Gunner Location: In Gunner's station.

Initiating Stimuli: TC provides new information for manual input to
ballistic computer.

ACTION

- Gunner will:**
1. Turn GUN SELECT switch to MAIN or COAX, as required.
 2. Turn AMMUNITION SELECT switch to appropriate ammunition type, if GUN SELECT switch is set to MAIN.
 3. Press MANUAL INPUT key for appropriate parameter.

AMMO TEMP
BARO PRESS
AIR TEMP
AMMO SUBDES
BR ADJUST
TUBE WEAR

NOTE A: MANUAL INPUT key will light and previously entered value for the parameter will display on computer control panel.

4. Enter new value for the parameter on the numeric keys.

NOTE B: The new value must be within the limits shown on inside of computer panel door.

- 5a. If new value (displayed on computer control panel) is not within limits, the MANUAL INPUT key will flash; if that happens, press CLEAR key and repeat Step 3.

or

- 5b. If new value (displayed on computer panel) is correct, press ENTER key.

NOTE C: Lighted MANUAL INPUT key and display will go out.

6. Repeat procedure for each position of AMMUNITION SELECT switch for AMMO SUBDES and BR ADJUST.

NOTE D: Input for AMMO SUBDES for each ammunition type is given in chart on computer control panel door.

MEASUREMENT

During Training: **Time** - Between end of initiating stimuli and completion of Step 5 for the final position of the AMMUNITION SELECT switch.

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training: **Time** - Between end of initiating stimuli and completion of Step 5 for the final position of the AMMUNITION SELECT switch.

Accuracy - As indicated by:

- . Correct manual input information for each parameter appears on computer control panel when recalled.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-143 to 2-144.

**TASK 2G: MANUALLY INPUT FIRE CONTROL DATA FOR AUTO
PARAMETERS INTO BALLISTIC COMPUTER**

CONDITIONS/STIMULUS

System State: Table A, Column 2G; and, Task 3C
completed, and information for manual entry into
AUTO parameters.
Gunner Location: In Gunner's station.
Initiating Stimuli: TC provides manual data for entry into AUTO
parameters.

ACTION

Gunner will: 1. Press AUTO INPUT key for appropriate parameter.
CROSSWIND
CANT
LEAD
RANGE

NOTE A: AUTO INPUT key will light and previous
automatic data input value for the
parameter will display on computer
panel display.

2. Enter new value for parameter on the numeric
keys.

NOTE B: The new value must be within the
limits shown on inside of computer
panel door.

3a. If new value (displayed on computer control panel)
is not within limits, the AUTO INPUT key will
flash; if that happens, press CLEAR key and
repeat Step 2.

or
3b. If new value entered (displayed on computer control
panel) is correct, press ENTER key.

NOTE C: If new value is within parameter limits,
display panel will go out. Auto input
key will stay lit, indicating that the
computer is not receiving automatic
sensor data for the parameter, and is
operating on the last manual input data.

4. Repeat procedure for each AUTO INPUT key.

NOTE D: To return to automatic input for para-
meter, press lighted AUTO INPUT key.

MEASUREMENT

During Training:

Time - Between end of initiating stimuli and completion of Step 4 for final AUTO INPUT key.

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training:

Time - Between end of initiating stimuli and completion of Step 4 for final AUTO INPUT key.

Accuracy - Correct manual input information for each AUTO INPUT parameter appears on computer control panel before ENTER button is pressed.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-143 to 2-145.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

19E Operator Requirements

COMPONENT:

Operate Coaxial Machinegun

PERFORMANCE OUTCOMES:

Mechanic will:

- 1J Remove coaxial machinegun.
- 2J Install coaxial machinegun.

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 1J: REMOVE COAXIAL MACHINEGUN

CONDITIONS/STIMULUS

System State: Table A, Column 1J; and, coaxial machinegun cleared.
Gunner Location: In Gunner's station.
Initiating Stimuli: TC tells Gunner to remove coaxial machinegun.

ACTION

- Gunner will:
1. Insure TURRET POWER switch is OFF.
 2. Insure coax safety switch is on S.
 3. Wear asbestos gloves if coax has been fired within past hour.
 4. Insure GUN/TURRET DRIVE is in MANUAL.
 5. Unlock main gun elevation travel lock (see Task 1E).
 6. Elevate main gun using manual controls (approximately 5 degrees above zero) so hole in main gun mount for coax front quick release pin is just above hydraulic pressure gage.
 7. Pull quick release pin from mount.
 8. Open smoke box doors.
 9. Slide receiver to rear and lift carefully.

NOTE A: Rear adapters will come out of mounting grooves, and barrel will come out of smoke enclosure tube.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 9.
Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training: Time - Between end of initiating stimuli and completion of Step 9.
Accuracy - As indicated by:
 . TURRET POWER switch is OFF.
 . Coax is removed undamaged.

REFERENCES

DEP 9-2350-255-10-1; p. 2-157.

TASK 2J: INSTALL COAXIAL MACHINEGUN

CONDITIONS/STIMULUS

System State: Table A, Column 2J; and, coaxial machinegun removed and cleared.
Gunner Location: In Gunner's station.
Initiating Stimuli: TC tells Gunner to install coaxial machinegun.

ACTION

- Gunner will:
1. Insure TURRET POWER switch is OFF.
 2. Insure coax safety switch is on S.
 3. Wear asbestos mittens if gun is hot.
 4. Insert barrel muzzle into smoke enclosure tube.
 5. Push receiver forward into mount.
 6. Slide rear adapters into groove of mount.
 7. Push machinegun forward until forward mounting hole is aligned with receiver holes, and machinegun trigger is engaged with roller on operating lever, with no pressure on trigger.
 8. Insure main gun is elevated (approximately 5 degrees above zero) so hole in main gun mount for coax front quick release pin is just above hydraulic pressure gage.
 9. Push front quick release pin through holes in mount and gun until pin locks in hole.
 10. Close smoke box doors.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 10.

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training: Time - Between end of initiating stimuli and completion of Step 10.

Accuracy - As indicated by:
• TURRET POWER switch is OFF
• Coax is installed undamaged.

REFERENCES

DEP 9-2350-255-10-1; p. 2-151.

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

19E Operator Requirements

COMPONENT:

Boresight Main Gun

PERFORMANCE OUTCOMES:

Mechanic will:

- 1K Boresight Gunner's primary sight.
- 2K Boresight muzzle reference sensor.

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 1K: BORESIGHT GUNNER'S PRIMARY SIGHT

CONDITIONS/STIMULUS

System State: Table A, Column 1K; and, tank positioned on level ground, a boresight target at a range near 1200 meters, a muzzle borescope inserted in main gun muzzle so that top and bottom witness marks on gun muzzle are aligned with marks on borescope, and eyepiece is on right of gun tube.

Gunner Location: In Gunner's Station.

Initiating Stimuli: TC tells Gunner to boresight main gun.

ACTION

- Gunner will:**
1. Turn GUN SELECT switch to MAIN.
 2. Turn FIRE CONTROL MODE switch to EMER.
 3. Move MAGNIFICATION lever on GPS lower panel to 10X.
 - 4a. Insert 1200 meters range into computer (see Task 2G).
 - or 4b. Insert 1200 meters range by lasing on target (see Task 3F).

NOTE A: Lasing on target establishes range for boresighting more accurately.

5. Press BORESIGHT key on computer control panel.

NOTE B: Display will show last boresight

6. View through GPS eyepiece and lay borescope reticle dot on clearly defined point on boresight target by using manual traverse and elevation controls and laying gun smoothly on target from low to high and from left to right. (See Task 4A, Step 4 and Task 3I).

NOTE C: Do not overshoot and return.

7. Remove hands from power control handles.
8. View through GPS eyepiece and move RETICLE ADJUST toggle switch as needed to lay GPS reticle dot on same point as muzzle borescope is on (see Step 6).

NOTE D: Activation of RETICLE ADJUST toggle will set MRS to zero. MRS boresighting must be done after GPS boresighting.

9. Record boresight values from computer display in equipment maintenance folder on DA Form 2408-10.
10. Press ENTER key on computer control panel to store GPS boresight data in computer.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 10.

Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training: Time - Between end of initiating stimuli and completion of Step 10.

Accuracy - As indicated by:

- . GPS reticle converges on same aim point as main gun.
- . GPS boresight data is stored in the computer.
- . GPS boresight data is logged into the equipment maintenance folder on DA Form 2408-10.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-158 to 2-160.

TASK 2K: BORESIGHT MUZZLE REFERENCE SENSOR

CONDITIONS/STIMULUS

System State: Table A, Column 2K; and, (see system state for Task 1K).
Gunner Location: In Gunner's station.
Initiating Stimuli: Task 1K is completed. This task should be done immediately after boresighting the GPS. Previous MRS boresight data was lost from computer during GPS boresighting.

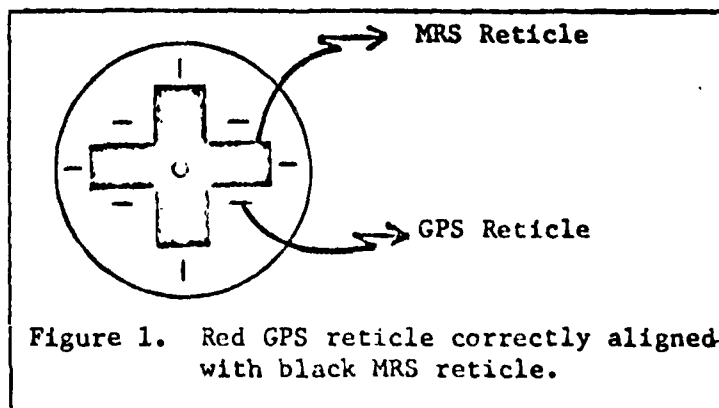
ACTION

- Gunner will:**
1. Turn FIRE CONTROL MODE switch to NORMAL.
 2. Press MRS key on computer control panel.

NOTE A: CAUTION - Do not press range buttons on power control handles. MRS reticle will be damaged if LRF is fired while MRS key is lit.

3. Press BORESIGHT key on computer control panel.
4. Squeeze palm switches on power control handles and hold for about 5 seconds while main gun goes to zero elevation.
5. Release power control handles.
6. View through GPS eyepiece and move RETICLE ADJUST toggle switch as needed to align red GPS reticle with black MRS reticle.

NOTE B: When reticles are correctly aligned, they will appear as in Figure 1.



7. Record azimuth and elevation of MRS boresight displayed in mils in computer in equipment maintenance folder on DA Form 2408-10.
8. Press ENTER key on computer control panel to store MRS boresight data in computer.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 8.
Accuracy - As indicated by match between steps given above and steps performed by Gunner.

End of Training: Time - Between end of initiating stimuli and completion of Step 8.
Accuracy - As indicated by:
 . MRS reticle converges on same aim point as GPS reticle and main gun.
 . MRS boresight data is stored in the computer.
 . MRS boresight data is logged into the equipment maintenance folder on DA Form 2408-10.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-160 to 2-161.

**XMI 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

19E Operator Requirements

COMPONENTS:

Prepare Commander's Station for Operation

PERFORMANCE OUTCOMES:

Mechanic will:

- 1A Operate Commander's hatch.**
- 2A Adjust TC seat and platforms.**
- 4A Perform before-operations maintenance checks and services on Commander's Station.**

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 1A: OPERATE COMMANDER'S HATCH

CONDITIONS/STIMULUS

System State: Table B, Column 1A
TC Location: In Commander's station.
Initiating Stimuli: Platoon leader tells TC to prepare station for operation.

ACTION

TC will:

NOTE A: The Commander's hatch must be in one of three positions when tank is in motion. The three positions are CLOSED, PROTECTED OPEN, and FULL OPEN.

NOTE B: The Commander's hatch can only be operated from inside the turret.

NOTE C: All location references to the TC left or right are determined from the TC weapon sight.

1. Raise hatch from CLOSED to PROTECTED OPEN position.
 - a. Squeeze release on top of operating handle.
 - b. Turn handle counterclockwise to unlock hatch.
 - c. Push up on hatch until locking lever is in protected open position.
 - d. Push up on rear of hatch to make sure that T-handle is locked.
2. Raise hatch from PROTECTED OPEN to FULL OPEN position.
 - a. Place right hand in center of hatch.
 - b. Grasp locking lever and push up while pushing up on hatch.

NOTE D: Hatch will pivot to vertical locked position.

 - c. Pull hatch at top edge to make sure hatch is locked in position.
3. Lower hatch to PROTECTED OPEN position.
 - a. Grasp operating handle with one hand and locking lever with the other hand.
 - b. Push up on locking lever to release lock.
 - c. Pull hatch down slowly with hand on operating handle while guiding hatch over opening.

NOTE E: Hatch will lock in protected open.

 - d. Push up and down on operating handle to make sure hatch is locked in position.

TABLE B

POSITION OF CONTROLS FOR TANK COMMANDER TASKS
WHEN TASK PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS				
	TASKS				
	1A	2A	4A	2B	1C
VEHICLE MASTER POWER switch	ON	ON	ON	ON	ON
TURRET POWER switch	ON	ON	ON	ON	ON
Commander's hatch	CLOSED	PROTECTED OPEN	FULL OPEN	FULL OPEN	FULL OPEN
POWER/MANUAL lever				MANUAL	POWER
Elevation travel lock				UNLOCKED	
Turret traverse lock				UNLOCKED	
Elevation crank trigger safety switch					SAFE

4. Close hatch.
 - a. Grasp T-bar locking pin to right of TC with one hand and push up on locking lever with other hand to release lock.
 - b. Release hand from locking lever and grasp .. operating handle.
 - c. Pull down on T-bar locking pin and operating handle to lower hatch below protected open position.
 - d. Pull T-bar locking pin toward TC and pull down on hatch.
 - e. Squeeze operating handle to depress release on top of handle.
 - f. Turn handle clockwise to lock hatch closed.

MEASUREMENT

During Training:	Time - Between end of initiating stimuli and completion of Step 4f.
	Accuracy - As indicated by match between steps given above and steps performed by TC.
End of Training:	Time - Between end of initiating stimuli and completion of Step 4f.
	Accuracy - As indicated by hatch being raised from closed to protected open; protected open to full open; and, lowered from full open to protected open, protected open to closed.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-93 to 2-94.

TASK 2A: ADJUST TC SEAT AND PLATFORMS

CONDITIONS/STIMULUS

System State: Table B, Column 2A.
TC Location: In Commander's station.
Initiating Stimuli: Task 1A is completed.

ACTION

- TC will:
1. While sitting in TC seat, pull up on height adjustment knob to release seat.
 2. Adjust seat height to align eyes level with commander's weapon sight by using body weight to lower seat or removing body weight to raise seat.
 3. Move head to check view in GPS extension and unity periscope.

NOTE A: Caliber .50 machinegun front and rear sights should be seen.

4. Check for maximum viewing over caliber .50 machinegun by pushing down on seat pan and seat back and standing on folded-down seat back.
5. Readjust seat as necessary to permit use of commander's weapon sight, GPS extension, and unity periscope with least amount of head movement, and to permit maximum viewing over caliber .50 machinegun.

NOTE B: Both platforms are adjusted for height at the same time with one control knob. When TC steps to main platform, seat pan will flip up 90 degrees.

NOTE C: Commander's hatch must be in protected open position before adjusting platforms.

6. Stand on turret floor and pull platform height control knob to the up position.

NOTE D. Knob is located above right edge of main platform on post.

7. Position bottom platform by hand and let knob go.
8. Stand on bottom platform and look through opening between hatch and unity periscope.
9. Readjust bottom platform as necessary so that TC is at eye level with sights of caliber .50 machinegun and has 360 degree field of vision.

10. Open Commander's hatch to full open position (See Task 1A, Step 2).
11. Press intermediate platform down with toe of boot so that when standing on the platform the TC is "name tag high" to top opening of hatch and power control handles are within reach.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 11.
Accuracy - As indicated by match between steps given above and steps performed by TC.

End of Training: Time - Between end of initiating stimuli and completion of Step 11.
Accuracy - As indicated by:
 . TC seat adjusted to permit use of commander's weapon sight, GPS extension, and unit periscope with least amount of head movement, and to permit maximum viewing over caliber .50 machinegun.
 . Bottom platform adjusted so that TC is at eye level with sights of caliber .50 machinegun and has 360 degree field of vision.
 . Intermediate platform adjusted so that when standing on the platform, the TC is "name tag high" to top opening of hatch and power control handles are within reach.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-94 to 2-95.

**TASK 4A: PERFORM BEFORE-OPERATIONS MAINTENANCE CHECKS AND SERVICES ON
COMMANDER'S STATION**

CONDITIONS/STIMULUS:

System State: Table B, Column 4A; and, an operational radio intercommunications system, Gunner and TC CVC helmets, a predetermined frequency set on the radio, gas mask M25A1, TM 9-2350-255-10-1, and DA Form 2404.

TC Location: In Commander's station.

Initiating Stimuli: Task 3A is completed.

ACTION

- TC will:**
1. Verify that fire bottle pressure is above minimum for the ambient temperature (see chart on bottles).
 2. Verify that fire bottles are secure in mounts.
 3. Clean all sensor lenses in Commander's station.
 4. Operate Commander's hatch through all positions (See Task 1A).
 5. Adjust Commander's seat and platforms (See Task 2A).
 6. Check seat cushions for rips and tears.
 7. Move Commander's knee guard from stowed position by lifting guard up and pivoting forward.
 8. Check condition of Commander's knee guard.
 9. Stow Commander's knee guard by pivoting guard to rear into stowed position.

NOTE A: Commander's knee guard should be moved from stowed position before main gun firing.

10. Check Commander's panel for operation of switches and panel light operation (See Task 1B).
11. Operate intercommunications equipment (See Task 3A).
12. Clean finned area of KY-57 Power Control Unit so that air can flow around unit.
13. Check Commander's gas particle filter equipment as follows:
 - a. Take breakaway socket of air hose from mount at right of Commander's seat.
 - b. Connect hose to cannister of protective mask.

NOTE B: GAS PARTICLE FILTER switch on Driver's master panel must be ON.

- c. Tell Loader to remove spring clip from air intake.
- d. Turn air heater ON.
- e. Regulate air temperature with air heater control knob until comfortable air temperature is reached.

- f. Mask and check operation of filter, hose, and connector.
 - g. Check microphone operation (See Task 3A).
 - h. Unmask and turn air heater OFF.
 - i. Disconnect hose from mask and connect break-away socket to mount.
 - j. Stow protective mask.
 - k. Tell Loader to replace spring clip over air intake opening.
14. List any uncorrected deficiencies on DA Form 2404.

MEASUREMENT

Time - Between end of initiating stimuli and completion of Step 13 (or Step 14 if uncorrected deficiencies are noted).

During Training: Accuracy - As indicated by match between steps given above and steps performed by TC.

Time - Between end of initiating stimuli and completion of Step 13 (or Step 14 if uncorrected deficiencies are noted).

End of Training: Accuracy - As indicated by:
 . Deficiencies corrected or listed on Operator portion of DA Form 2404.

REFERENCES

DEP 9-2350-255-10-1; pp. 2-45 to 2-47; pp. 2-109 to 2-110.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

19E Operator Requirements

COMPONENT:

Power Up Commander's Station

PERFORMANCE OUTCOMES:

Mechanic will:

2B Operate Commander's power control handles.

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 2B: OPERATE COMMANDER'S POWER CONTROL HANDLES

CONDITIONS/STIMULUS

System State: Table B, Column 2B
TC Location: In Commander's Station
Initiating Stimuli: Task 1B is completed.

ACTION

TC will: NOTE A: Commander's power control handle takes control away from Gunner's handles when Commander's handle palm switch is depressed.

1. Grasp Commander's power control handle and squeeze palm switch.
2. With palm switch squeezed, traverse turret right and left by moving handle to the right then to the left.

NOTE B: Traversing speed increases as handle is turned further and slows as handle is turned toward center position.

3. With palm switch squeezed, elevate gun by pulling back on handle and then depress gun by pushing forward on handle.

NOTE C: Rate of movement of main gun increases as handle is pulled/pushed further and slows as handle is pulled/pushed toward center position.

NOTE D: Releasing palm switch causes turret and main gun to stop moving. When power control handle is released, handle returns to center position.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 3.

Accuracy - As indicated by match between steps given above and steps performed by

Time - Between end of initiating stimuli and
completion of Step 3.

End of Training:

Accuracy - As indicated by:

- . Turret is traversed both right and left.
- . Main gun is elevated.
- . Main gun is depressed.

REFERENCES

DEP 9-2350-255-10-1; p. 2-99.

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

19E Operator Requirements

COMPONENT:

Operate Commander's Machinegun

PERFORMANCE OUTCOMES:

Mechanic will:

1C Clear Commander's machinegun.

MEASUREMENT:

As described for each task on Task Analysis Outline.

TASK 1C: CLEAR COMMANDER'S MACHINEGUN

CONDITIONS/STIMULUS

System State: Table B, Column 1C; Commander's machinegun loaded.
Commander Location: In Commander's station.
Initiating Stimuli: Completion of firing, or requirement to boresight,
or remove Commander's machinegun.

ACTION

Commander will:

1. Insure machinegun is cooled before clearing.
2. Set machinegun safety switch to SAFE.
3. Raise cover.
4. Lift extractor from ammunition belt.
5. Remove belt from receiver.
6. Stow belt in container.
7. Set machinegun safety switch to FIRE.
8. Pull charger handle to rear and hold it there.
9. Insure that there is no round in chamber or T-slot of bolt.
10. Allow charger handle to go forward.
11. Close cover.
12. Press butterfly trigger.
13. Set machinegun safety switch to SAFE.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and completion of Step 13.
Accuracy - As indicated by match between steps given above and steps performed by Commander.

End of Training: Time - Between end of initiating stimuli and completion of Step 13.
Accuracy - As indicated by:
. Belt is removed from receiver.
. No round is in chamber or T-slot of bolt.

REFERENCES

DEP 9-2350-255-10-1; p. 2-104.

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

19E Operator Requirements

COMPONENT:

Driver Start Engine

PERFORMANCE OUTCOMES:

Mechanic will:

1C Start tank engine-normal start.

MEASUREMENT:

As described on Task Analysis Outline.

TASK 1C: START ENGINE - NORMAL START

CONDITIONS/STIMULUS

System State: Table C, Column 1C; and, Power Up Hull Systems procedures completed.
Driver Location: In Driver's station.
Initiating Stimuli: TC tells Driver to start engine.

ACTION

- Driver will:
1. Make sure Driver's seat is in open-hatch position.
 2. Press in START button (located on Driver's instrument panel) for about a second..

NOTE A: The STARTED light (located above START button) should come on within 25 to 60 seconds after START button is pressed and will stay on for about 10 seconds.

MEASUREMENT

During Training: Time - Between end of initiating stimuli and 25 to 60 seconds after completion of Step 2.
Accuracy - As indicated by match between steps given above and steps performed by Driver.

End of Training : Time - Between end of initiating stimuli and 25 to 60 seconds after completion of Step 2.
Accuracy - As indicated by:
.STARTED light coming on for about 10 seconds.

REFERENCES

DEP 9-2350-255-10-1; p. 2-73.

TABLE C

POSITION OF CONTROLS FOR DRIVER TASK WHEN TASK
PERFORMANCE BEGINS

CONTROLS	POSITION OF CONTROLS TASK 1C
TURRET POWER switch	OFF
VEHICLE MASTER POWER switch	ON
TRANSMISSION SHIFT control	N
Parking Brake	ENGAGED
Driver's Hatch handles	OPEN
Intercommunication Monitor switch	INT ONLY
Domelight	ON
LIGHT switch	OFF
Drain Valve handles	CLOSED
GAS PARTICLE FILTER switch	OFF
Air Heater Control	OFF
NIGHT PERISCOPE	OFF
BILGE PUMP	OFF
SMOKE GENERATOR	OFF

APPENDIX B
TURRET ASSEMBLY

LESSON PLAN OUTLINE

TURRET ASSEMBLY

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 24 tasks in the Turret Assembly module.

CONDITIONS: As described in the PRELIMINARY and FOLLOW ON PROCEDURES.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the mechanic and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The procedures described under MECHANIC WILL for each task are derived from Task and Skill Analysis Report, Final, [XML] for the Tank, Combat, Full Tracked 105-MM Gun. Chrysler Corporation, 1979. There is a possibility that the procedures have changed with design changes in the XML. The procedures should be updated for the XML based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XML procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

¹Boldovici, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Turret Cords (2.15.1)

PERFORMANCE OUTCOMES:

Mechanic will:

2.15.1.1 Replace cord assembly. (3 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by;

Task 2.15.1.1 a. Five sets of cords replaced with both ends of each cord hooked to turret.
--

TASK 2.15.1.1 REPLACE CORD ASSEMBLY

PARTS: Cord (NPN)

TOOLS: None

EXPENDABLES: None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: This procedure applies to all five cords.

1. Unhook both ends of cord from turret.
2. Turn in damaged cord.
3. Hook both ends of cord to turret.

FOLLOW ON PROCEDURES:

None

REFERENCES:

None

TIME:

3 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Turret Lock Assembly (2.15.2)

PERFORMANCE OUTCOMES:

Mechanic will:

***2.15.2.1 Inspect turret lock assembly. (6 minutes)**

2.15.2.5 Replace turret lock assembly handle and spring. (8 minutes)

MEASUREMENT:

(for each task)

During Training: **Time - Between end of initiating stimuli and completion of task.**
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: **Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.**
 Accuracy - As indicated by:

Task 2.15.2.1	a. Turret lock cover not damaged.
	b. Turret lock spring not damaged.
	c. Turret lock handle locks.
	d. Turret lock lever assembly not damaged.
	e. Turret lock assembly teeth engage with ring gear.

Task 2.15.2.5	a. Lever and handle on turret lock assembly in "locked" position.
----------------------	--

***TASK 2.15.2.1 INSPECT TURRET LOCK ASSEMBLY**

PARTS:	None
TOOLS:	None
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: Make sure that MASTER POWER SWITCH is in OFF position.

1. Inspect cover for damage. (Cover is damaged if it is bent, cracked, or if words cannot be read.)
2. Inspect spring for damage. (Spring is damaged if broken.)
3. Rotate handle from LOCKED position to UNLOCKED position, and back to locked position.
4. Check that the mechanism locks. (If it does not, handle is damaged.)
5. Inspect lever assembly for damage. (Lever assembly is damaged if it is cracked or if pin is broken.)
6. Inspect lock assembly for proper engagement of teeth with ring gear. (Lock assembly is damaged if it does not properly engage, or if teeth are broken or cracked.)

FOLLOW ON PROCEDURE:

1. Replace damaged parts.

REFERENCES:

DEP 9-2350-255-20-2-1; pp. 2-37 and 2-38.

TIME:

6 Minutes

TASK 2.15.2.5 REPLACE TURRET LOCK ASSEMBLY HANDLE AND SPRING

PARTS:	Handle assembly (XM60927) Pin, cotter (MS24665-283) Spring, helical (7953781)
TOOLS:	Pliers, slip joint Punch, drive pin, 1/4 inch point Hammer, hand, ball peen
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Remove turret lock assembly cover.
2. Remove turret lock assembly shaft.

MECHANIC WILL:

NOTE A: Make sure that MASTER POWER SWITCH is in OFF position.

1. Remove lever and handle from lock assembly.
2. Remove cotter pin from roller pin using pliers.
3. Discard cotter in.
4. Drive out roller pin from handle using punch and hammer.
5. Remove lever and spring from handle.
6. Turn in handle if defective.
7. Turn in spring if defective.
8. Position spring on handle.
9. Align holes in lever with holes in handle.
10. Insert roller pin through holes.
11. Install new cotter pin in roller pin using pliers.
12. Put lever and handle on lock assembly in "locked" position.

FOLLOW ON PROCEDURES:

1. Install turret lock assembly shaft.
2. Install turret lock assembly cover.

TASK 2.15.2.5 REPLACE TURRET LOCK ASSEMBLY (Cont'd.)

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-7 and 4-8, 4-14 and 4-16.

TIME:

8 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Commander's Seat Assembly (2.15.3)

PERFORMANCE OUTCOMES:

Mechanic will:

2.15.3.5 Replace Commander's seat back recess pad. (5 minutes)

2.15.3.9 Replace Commander's seat lower platform. (25 minutes)

MEASUREMENT:

(for each task)

During Training: **Time - Between end of initiating stimuli and completion of task.**
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: **Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.**
Accuracy - As indicated by:

Task 2.15.3.5 a. New seat pad positioned on seat back and pressed into place.

Task 2.15.3.9 a. New Commander's seat lower platform installed.

TASK 2.15.3.5 REPLACE COMMANDER'S SEAT BACK RECESS PAD

PARTS:	Pad (SK-173-1)
TOOLS:	Knife, putty
EXPENDABLES:	Solvent, cleaning, P680, type II

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Fold seat back down on seat cushion.
2. Remove pad from seat using knife.
3. Discard pad.

WARNING: Solvent burns easily. Do not use solvent near open fire.
--

4. Clean seat back using solvent and rag and dry with clean rag.
5. Apply adhesive to seat back.
6. Position pad on seat back and press in place.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-25.1 to 4-25.2.

TIME:

5 Minutes

TASK 2.15.3.9 REPLACE COMMANDER'S SEAT LOWER PLATFORM

PARTS:	Platform (XM20671) Pin, cotter, 2 ea. (NPH) Pin, 3 ea. (MS39086-289)
TOOLS:	Pliers, round nose Hammer, hand, ball peen Punch, drive pin, tapered, 1/8 inch point
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Put lower platform in its highest position.

MECHANIC WILL:

1. Remove footrest.
2. Drive out three pins in platform using hammer and punch.
3. Slide platform off support arm.
4. Turn in platform.
5. Set footrest in place on new platform.
6. Secure footrest with pins.
7. Slide platform onto support arm.
8. Align holes on platform and support arm.
9. Drive in three pins using hammer and punch.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-37 and 4-38, 4-51 and 4-52.

TIME:

25 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Gunner's Seat Assembly (2.15.4)

PERFORMANCE OUTCOMES:

Mechanic will:

2.15.4.2 Replace Gunner's seat assembly (4 minutes)

2.15.4.3 Replace Gunner's seat back cushion (11 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.15.4.2 a. Seat assembly, pedestal secured to floor mount.

Task 2.15.4.3 a. New seat back cushion installed.
--

TASK 2.15.4.2 REPLACE GUNNER'S SEAT ASSEMBLY

PARTS:	Seat assembly, gunner's (NPN) Washer, lock 4 ea. (MS 35333-42)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Soldier A unscrews and takes out seat assembly.
2. Soldier B assists Soldier A remove seat assembly from tank.

MECHANIC WILL:

1. Unscrew and remove four screws, washers, and lockwashers securing pedestal to floor mount using socket and handle.
2. Discard lockwashers.
NOTE A: Do not lift seat by height adjust handle.
3. Lift seat up and out of tank through Loader's hatch.
4. Place seat on clean, flat work area.
5. Lower new seat through Loader's hatch.
6. Align holes in bottom of pedestal with holes in floor mount.
7. Screw in and tighten four screws, washers, and new lockwashers securing pedestal to floor mount using socket and handle.

FOLLOW ON PROCEDURE:

1. Operate gunner's seat.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-67 and 4-68, 4-94 and 4-95.

TIME:

4 Minutes

TASK 2.15.4.3 REPLACE GUNNER'S SEAT BACK CUSHION

PARTS:	Cushion, seat back (XM3691) Washer, coned, 8 ea. (XM65408-1)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove eight nuts and coned washers using socket and handle.
2. Discard coned washers.
3. Remove cushion from frame.
4. Turn in damaged cushion.
5. Align studs on back of new cushion with holes in frame.
6. Secure in place with eight screws and new coned washers using socket and handle.

FOLLOW ON PROCEDURES

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-69 and 4-70, 4-91 to 4-93.

TIME:

11 Minutes

MODULE:

COMPONENT :

PERFORMANCE OUTCOMES:

2.15.5.16 Replace Loader's platform height adjustment locking pin. (4 minutes)

(for each task)

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

B-16

TASK 2.15.5.16 REPLACE LOADER'S PLATFORM HEIGHT ADJUSTMENT LOCKING PIN

PARTS:	Pin (XM8665) Spring, helical (MS24585-1478) Knob, ball (XM8664-1)
TOOLS:	Hammer, hand, ball peen Punch, drive pin, 1/4 inch point Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 5/16 inch
EXPENDABLES:	Sealing compound, thread locking, MIL-S-46163

PRELIMINARY PROCEDURE:

1. Remove seat frame.

MECHANIC WILL:

1. Hold platform adjuster so it does not fall when spring pin and pin assembly are removed.
2. Drive spring pin out of seat adjuster using hammer and punch.
3. Lift out pin assembly.
4. Lower platform adjuster to bottom of post.
5. Unscrew and remove knob from pin assembly. (Washer and spring will fall off.)
6. Inspect knob and spring for bends or cracks.
7. If damaged, replace part.
8. Turn in pin.
9. Slide platform adjuster up on post and hold while pin assembly and spring pin are being installed.
10. Put washer and spring on new pin.
11. Put pin into housing.
12. Hold washer down with screwdriver.
13. Insert spring pin ensuring spring pin holds washer down.
14. Tap in spring pin using hammer and punch.
15. Spread thin coat of sealing compound on pin threads.
16. Screw on and tighten by hand.

**TASK 2.15.5.16 REPLACE LOADER'S PLATFORM HEIGHT ADJUSTMENT LOCKING PIN
(Cont'd.)**

FOLLOW ON PROCEDURE:

1. Install seat frame.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-111 and 4-112, 4-118 to 4-120.

TIME:

4 Minutes

MODULE :

COMPONENT :

PERFORMANCE OUTCOMES:

2.15.6.1 Inspect Loader's latch. (6 minutes)

MEASUREMENT:

During Training:

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

- B-19**

TASK 2.15.6.1 INSPECT LOADER'S HATCH

PARTS: None

TOOLS: None

EXPENDABLES: None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Inspect retainer for damage. (Retainer is damaged if cracked.)
2. Check that periscope turntable rotates freely without binding in both directions.
3. Inspect periscope turntable for damage. (Turntable is damaged if cracked.)
4. Inspect hatch for damage. (Hatch is damaged if cracked or has broken welds.)

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-1; pp. 2-31 to 2-33.

TIME:

6 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Commander's Weapon Station Hatch Mechanism Assembly (2.15.7)

PERFORMANCE OUTCOME:

Mechanic will:

2.15.7.2 Replace Commander's hatch latching mechanism. (15 minutes)

2.15.7.13 Replace Commander's unity periscope seal. (15 minutes)

MEASUREMENT:

(for each task)

During Training: **Time - Between end of initiating stimuli and completion of task.**
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: **Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.**
 Accuracy - As indicated by:

<p>Task 2.15.7.2 a. Same number of shims placed in same position on latch assembly when latch assembly installed as when removed.</p> <p> b. Latch assembly holds hatch open in all positions.</p>
--

<p>Task 2.15.7.13 a. Seal pressed firmly into adhesive.</p> <p> b. Each end of seal cut on 30 degree angle.</p>

TASK 2.15.7.2 REPLACE COMMANDER'S HATCH LATCHING MECHANISM

PARTS:	Plate (XM65245) Shims, 3 ea. (11599059-4) Cam (7027968) Shaft (7027960) Handle (11599029) Guide (XM65253) Bolt (XM65188) Cartridge Assembly (NPN) Washer, lock, 2 ea. (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Extension, socket wrench, 3/8 inch square drive, 3 inch Handle, socket wrench, ratchet, 3/8 inch square drive Hammer, hand, ball peen Punch, drive pin, tapered, 1/8 inch point Brush, cleaning
EXPENDABLES:	Solvent, cleaning, P-D-680, type 11 Rags, wiping

PRELIMINARY PROCEDURE:

1. Close and lock hatch.

MECHANIC WILL:

NOTE A: Notice position of shims when removing latch.

1. Unscrew and remove two screws and lockwashers securing latch assembly using socket, extension, and handle.
2. Discard lockwashers.
3. Remove latch assembly and cam plate from mount pad.
4. Move latch assembly to clean work area.
5. Drive out spring pin using hammer and punch.
6. Push out shaft using hammer and punch.

NOTE B: Spring must be put back the same way as taken out.

7. Separate handle, spring, cam, cam plate, and bolt.
8. Take cartridge assembly out of bolt by hand.

CAUTION: Solvent burns easily. Do not use near open fire.
--

TASK 2.15.7.2 REPLACE COMMANDER'S HATCH LATCHING MECHANISM (cont'd.)

9. Clean bolt, cartridge assembly, cam plate, shaft, spring, cam, handle, shims, and guide using brush and solvent and dry with rag.
10. Inspect parts for breaks, cracks, wear, or bends.
11. If damaged, turn in part and replace it.
12. Put cartridge assembly into bolt.
13. Put prongs of bolt through holes in cam plate.
14. Put spring between prongs of bolt with spring ends in place.
15. Hold cam and handle on bolt and align holes.
16. Insert shaft to secure cam, handle, spring, and bolt.
17. Align holes in bolt and shaft.
18. Insert spring pin securing shaft and bolt using hammer and punch.
19. Put guide over handle.

NOTE C: Use same number of shims and place in same position on latch assembly when installing latch assembly as noted when removed.

20. Hold cam plate and shims on mount pad.
21. Put latch assembly into pad hole.
22. Screw in and tighten two screws and new lockwashers using socket, extension, and handle.

FOLLOW ON PROCEDURE:

1. Check that latch assembly holds hatch open in all positions.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-175, 4-177 to 4-180.

TIME:

15 Minutes

TASK 2.15.7.13 REPLACE COMMANDER'S UNITY PERISCOPE SEAL

PARTS:	None
TOOLS:	Knife, Pocket Brush, adhesive
EXPENDABLES:	Seal, rubber Compound, sealing, MIL-S-11031 Rag, wiping Adhesive, MIL-A-46106A (RTV-732, Dow Corning) Solvent, cleaning PD-680, type 11.

PRELIMINARY PROCEDURE:

1. Remove commander's unity periscope.

MECHANIC WILL:

1. Remove seal from periscope using knife and discard seal.

WARNING: Solvent burns easily. Do not use solvent near open fire.
--

2. Clean periscope mating surface of old adhesive and other foreign material using solvent and rag.
3. Measure seal mating surface around periscope and cut seal to length. (Allow for cutting each end of seal on a 30 degree angle to ensure a watertight fit.)
4. Apply a small bead of adhesive (about 1/16 inch diameter) around mating surface of periscope.
5. Install seal and press firmly onto adhesive.
6. Cut each end of seal on a 30 degree angle where seal ends meet.
7. Press seal ends together and apply sealing compound using brush.

FOLLOW ON PROCEDURE:

1. Install commander's unity periscope.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-66 and 3-66.i.

TIME:

15 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Ammunition Door Assembly (2.15.8)

PERFORMANCE OUTCOMES:

Mechanic will:

- 2.15.8.4 Adjust ready ammo door limit switch. (21 minutes)
- 2.15.8.7 Adjust roller assemblies. (6 minutes)
- 2.15.8.10 Adjust stowage door spring plungers. (3 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

Task 2.15.8.4	a. Multimeter reads 0 VDC when test leads are hooked-up between pin 28+ and pin 46- in TEST 2 receptacle on turret networks box and ready ammo door is opened and closed.
	b. Screws holding actuator in place torqued between 96 and 120 inch-pounds (11 to 14 newton meters).

Task 2.15.8.7	a. Ammunition doors run smoothly without binding when opened and closed.
---------------	--

Task 2.15.8.10	a. Stowage door opens 1/2 inch when released in closing.
----------------	--

TASK 2.15.8.4 ADJUST READY AMMO DOOR LIMIT SWITCH

PARTS:	None
TOOLS:	Multimeter Wrench, torque 0 to 200 inch-pounds Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive.
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Set ammo doors for manual operation.
2. Relieve hydraulic pressure.

MECHANIC WILL:

1. Close ammo doors.
2. Loosen two screws holding actuator using socket and handle.
3. Hook up multimeter test leads between pin 28+ and pin 46- in TEST 2 receptacle on turret networks box.
4. Move meter switch to +50 VDC range.
5. Put TURRET POWER and VEHICLE MASTER POWER switches to ON.
6. Set spacing by moving actuator away from limit switch until meter shows voltage.
7. Slowly move actuator towards switch until meter reading just drops to 0 VDC.
8. Tighten two screws using socket and handle.
9. Torque screws between 96 and 120 inch-pounds (11 to 14 newton meters) using torque wrench.
10. Check setting by opening door. (Voltage should show on meter.)
11. Close door. (Voltage should show 0 VDC.)
12. If unable to get these readings, repeat steps 1 thru 11.
13. Pull out meter from TEST 2 receptacle.
14. Set TURRET POWER and VEHICLE MASTER POWER switches to OFF.

TASK 2.15.8.4 ADJUST READY AMMO DOOR LIMIT SWITCH (cont'd.)

FOLLOW ON PROCEDURES:

1. Build up hydraulic pressure.
2. Set ammo doors for automatic operation.

REFERENCES:

DEP 9-2350-255-20-2-3-2; p. 4-248.

TIME:

21 Minutes

TASK 2.15.8.7 ADJUST ROLLER ASSEMBLIES

PARTS: None

TOOLS: Handle, socket wrench, ratchet, 1/2 inch square drive
Socket, socket wrench, 1/2 inch square drive
Key, socket head screw, 1/2 inch
Wrench, torque, 1 to 600 foot-pounds

EXPENDABLES: None

PRELIMINARY PROCEDURE:

None

MECHANIC WILL:

1. Open and close ammunition doors manually.
2. Feel if doors run smoothly without binding and are not too loose.
3. If doors bind or are too loose, do the following:
 - a. Loosen nut on top roller by holding screw head with key and using socket and handle on nut.
 - b. Move roller down for binding door; move roller up for loose door.
 - c. Tighten and torque nut between 150 and 180 foot-pounds (203 to 244 newton meters) using torque wrench.
 - d. Check for smooth movement of doors.
 - e. Repeat procedure as necessary.

FOLLOW ON PROCEDURE:

1. Set ammo doors for automatic operation.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 2-240.

TIME:

6 Minutes

TASK 2.15.8.10 ADJUST STOWAGE DOOR SPRING PLUNGERS

PARTS: None

TOOLS: Socket, socket wrench, 3/8 inch square drive, 5/16 inch
Handle, socket wrench, ratchet, 3/8 inch square drive

EXPENDABLES: None

PRELIMINARY PROCEDURE:

1. Set ammo door for manual operation.

MECHANIC WILL:

1. Open and close stowage door.
2. Check that door opens 1/2 inch when released.
3. If not, screw plungers in or out to get correct door opening using socket and handle.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-243 and 4-244.

TIME:

3 Minutes

MODULE:

COMPONENT:

PERFORMANCE OUTCOMES:

Mechanic will:

MEASUREMENT:

(for each task)

During Training:

- Time** - Between end of initiating stimuli and completion of task.
- Accuracy** - As indicated by match between steps indicated for each task and steps performed by mechanic.

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

End of Training: Accuracy - As indicated by:

B-30

TASK 2.15.9.1 REPLACE AUDIO FREQUENCY AMPLIFIER MOUNTING BRACKET

PARTS:	Washer, star, 8 ea. (NPN) Bracket, mounting (NPN)
TOOLS:	Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 7/16 inch Socket, socket wrench, 3/8 inch square drive, 9/16 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove six screws, starwashers, and washers holding mounting bracket to turret wall using 9/16 inch socket and handle.
2. Discard starwashers.
3. Unscrew and remove screw and starwasher holding harness strap to turret wall using 7/16 inch socket and handle.
4. Discard starwasher.
5. Unscrew and remove bottom screw and starwasher holding cable strap to turret using 7/16 inch socket and handle.
6. Discard starwasher.
7. Tilt top of bracket away from turret wall and slide bolt flange of bracket from under harness protective cover.
8. Lift bracket away from turret ventilating blower.
9. Turn in mounting bracket.
10. Slip bottom lip of new mounting bracket under harness cover.
11. Tilt top of bracket away from wall.
12. Screw in and tighten six screws, new starwashers, and washers on bracket using 9/16 inch socket and handle.
13. Screw in and tighten screw and new starwasher on strap using 7/16 inch socket and handle.
14. Screw in and tighten screw and new starwasher on bottom of strap using 7/16 inch socket and handle.

TASK 2.15.9.1 REPLACE AUDIO FREQUENCY AMPLIFIER MOUNTING BRACKET (Cont'd.)

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-2-3-2; pp. 4-218.5 to 4-218.8.

TIME:

15 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Turret Assembly (2.15)

COMPONENT:

Safety Guards and Pads (2.15.10)

PERFORMANCE OUTCOMES:

Mechanic will:

2.15.10.8 Replace spent ammo screen guard magnet. (12 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.15.10.8 a. Spent ammo screen guard magnet installed and screen guard in stowed position.

TASK 2.15.10.8 REPLACE SPENT AMMO SCREEN GUARD MAGNET

PARTS:	Washer, lock, 2 ea. (MS 35333-39) Magnet (XM23114)
TOOLS:	Screwdriver, offset, Phillips No. 2 Wrench, box end, 3/8 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Swing guard away from stowage box.
2. Remove contents from box until two screws can be reached from inside.
3. Hold two screws with screwdriver and unscrew and remove nuts and lockwashers using wrench.
4. Discard two lockwashers.
5. Remove magnet.
6. Remove two screws from magnet.
7. Turn in damaged magnet.
8. Put in two screws and put magnet in place.
9. Put two new lockwashers on screws.
10. Hold two screws with screwdriver and screw on two nuts using wrench.
11. Swing guard back into stowed position.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20; pp. 4-224 to 4-227.

TIME:

12 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Turret Ammunition Racks (2.15.11)

PERFORMANCE OUTCOMES:

Mechanic will:

2.15.11.1 Replace ammo rack plunger. (15 minutes)

2.15.116 Replace ammo tube and hinge. (12 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

Task 2.15.11.1 a. Plungers replaced in ammo basket stowage rack and bustle ammo rack.

Task 2.15.11.6 a. All damaged ammo tubes and hinges replaced.

TASK 2.15.11.1 REPLACE AMMO RACK PLUNGER

PARTS: Plunger (XM 66580)

TOOLS: Hammer, hand, ball peen Punch drive pin, tapered,
1/8 inch point
Screwdriver, flat tip
Wrench, open end, 1 inch

EXPENDABLES: None

PRELIMINARY PROCEDURE:

1. Open ammo compartment doors.

MECHANIC WILL:

NOTE A: This procedure applies to both the ammo basket stowage rack and bustle ammo rack. Replace damaged plungers only.

1. Unscrew plug using wrench.
2. Pull out plunger, plug, spacer, and spring pin together.
3. Take out spring, two spacers, and sleeve using screwdriver.
4. Knock out spring pin using hammer and punch.
5. Remove spacer and plug.
6. Turn in plunger.
7. Slide sleeve, one spacer, spring, and other spacer into tube.
8. Put plug and spacer on plunger.
9. Tap spring pin through plunger using hammer and punch.
10. Put plunger in tube.
11. Screw in plug using wrench.

FOLLOW ON PROCEDURE:

1. Close ammo compartment doors.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-267 to 4-271.

TIME:

15 Minutes

TASK 2.15.11.6 REPLACE AMMO TUBE AND HINGE

PARTS:	Tube assembly (XM67104) Screw, cap, hex hd, 2 ea. (MS90728-8) Washer, flat, 2 ea. (MS9320-10) Pin (XM22491)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Extension, socket wrench, 3/8 inch square drive, 9-inch Handle, socket wrench, ratchet, 3/8 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Remove turret basket ammo rack.

MECHANIC WILL:

1. Pull up on quick release pin to release tube from weldment.
2. Unscrew and remove two screws and washers using socket, extension, and handle.
3. Push in tube toward tube next to it and pull out on tube.
4. Take out pin from weldment.

NOTE A: The pin, screw, washer, and tube welded to ammunition tube make up the hinge.

5. Inspect hinge and tube for damage. (If damaged, turn in and replace part).
6. Put pin in support with flat side facing to rear of tube (small end of tube).
7. Slide tube into rack.
8. Screw in two screws and washers using socket, extension, and handle.
9. Insert quick release pin into weldment.

FOLLOW ON PROCEDURE:

1. Install turret basket ammo rack.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-285 to 4-287.

TIME:

12 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Turret Blow-Out Panel Assembly (2.15.12)

PERFORMANCE OUTCOMES:

Mechanic will:

2.15.12.1 Replace slide blow-out panel and frame. (30 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.15.12.1 a. Screws holding blow-out panel in place torqued between 360 and 432 inch-pounds (41 to 49 newton meters).

TASK 2.15.12.1 REPLACE SIDE BLOW-OUT PANEL AND FRAME

PARTS:	Plate, blow-out (NPN) Plate, blow-out (NPN) Frame (NPN) Frame (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Knife, putty Wrench, torque, 0 to 600 inch-pounds Brush, paint
EXPENDABLES:	Solvent, cleaning, P-D-680, Type II Sealing compound, general purpose, MIL-S-11031 Rags, wiping

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: The left side plate and frame are 0.13 and 0.06 inches (.33 and .15 centimeters wider than the right side. Mixing them with the left side will cause an improper fit.

1. Unscrew and remove 14 screws and washers using socket and handle.
2. Lift off panel and frame by hand.

WARNING: Solvent burns easily. Do not use solvent near open fire.

3. Clean around turret opening using solvent, rag, and putty knife (remove all old adhesive) and dry with clean rag.
4. Clean plate with solvent, rag, and putty knife (remove all old adhesive) and dry with clean rag.
5. Inspect plate and frame for cracks and bends. (If damaged, turn in and replace part.)

WARNING: Sealing compound burns easily. Do not use near open fire. Use in well-ventilated area.

6. Spread sealing compound on plate and turret mounting surface with brush.

TASK 2.15.12.1 REPLACE SIDE BLOW-OUT PANEL AND FRAME

7. Put plate into opening.
8. Line up frame on turret.
9. Screw in and tighten 14 screws and washers using socket and handle.
10. Torque screws between 360 and 432 inch-pounds (41 to 49 newton meters) using torque wrench.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-305 to 4-308.

TIME:

30 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Assembly (2.15)

COMPONENT:

Radio Antenna Mount (2.15.13)

PERFORMANCE OUTCOMES:

Mechanic will:

2.15.13.1 Replace receiver/transmitter antenna mount. (21 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

<p>Task 2.15.13.1 a. Screws holding antenna mount in place torqued between 360 and 432 inch-pounds (41 to 49 newton meters).</p>

TASK 2.15.13.1 REPLACE RECEIVER/TRANSMITTER ANTENNA MOUNT

PARTS:	Antenna assembly (NPN) Gasket, 2 ea. (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, adjustable, 6 inch Wrench, torque, 0 to 600 inch-pounds
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Remove four screws and washers using socket and handle.
2. Lift up antenna.
3. Unscrew and remove two electrical plugs.
4. Remove one screw and washer securing terminal strap using adjustable wrench.
5. Remove terminal strap, spacer, and two gaskets.
6. Discard gaskets.
7. Turn in defective antenna and mount.
8. Put spacer and two new gaskets in place.
9. Screw in and tighten two electrical plugs.
10. Put terminal strap in place and secure with one screw and washer using adjustable wrench.
11. Put antenna and mount in place.
12. Secure with four screws and washers using socket and handle.
13. Torque screws between 360 and 432 inch-pounds (41 to 49 newton meters) using torque wrench.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-313 to 4-315.

TIME:

21 Minutes

B-42

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Turret Assembly (2.15)

COMPONENT:

Internal Gun Travel Lock (2.15.14)

PERFORMANCE OUTCOMES:

Mechanic will:

- * 2.15.14.1 Replace gun elevation lock quick release pin. (15 minutes)

MEASUREMENT:

(for each task).

During Training:

Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

Task 2.15.14.1 a. Quick release pin pushed into clevis and link.

***TASK 2.15.14.1 REPLACE GUN ELEVATION LOCK QUICK RELEASE PIN**

PARTS:	Pin, quick release (MS 17984C-1218
TOOLS:	None
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Hold link, press button and pull quick release pin out of clevis.
2. Inspect quick release pin for damage.
3. If bent or cracked or if button is hard to move, turn in and replace part.
4. Push down button and push quick release pin into clevis and link.
5. Release button.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-319 to 4-321.

TIME:

15 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Turret Assembly (2.15)

COMPONENT:

Turret Platform (2.15.15)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.15.15.1 Replace hull-turret slipring cover. (6 minutes)
- *2.15.15.2 Replace turret harness channel cover. (6 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

Task 2.15.15.1 a. Screws holding slipring cover in place torqued between 30 and 36 foot-pounds (40.5 to 48.5 newton meters).
--

Task 2.15.15.2 a. Cover put on stand-offs.
--

***TASK 2.15.15.1 REPLACE HULL-TURRET SLIPRING COVER**

PARTS:	Washer, lock, 4 ea. (NPN) Cover (NPN)
TOOLS:	Socket, socket wrench, 1/2 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 1/2 inch square drive Wrench, torque, 0 to 200 foot-pounds
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Depress gun tube.
2. Bleed off pressure in hydraulic system.
3. Remove turret platform shield/blanket.

MECHANIC WILL:

1. Unscrew and remove four screws, lockwashers, and washers from slipring cover using socket and handle.
2. Discard lockwashers.
3. Lift off cover.
4. Inspect cover for cracks or bends.
5. If damaged, turn in and replace cover.
6. Put cover in place.
7. Screw in and tighten four screws, washers, and new lockwashers using socket and handle.
8. Torque screws between 30 and 36 foot-pounds (40.5 to 48.5 newton meters) using torque wrench.

FOLLOW ON PROCEDURES:

1. Install turret platform shield/blanket.
2. Build up pressure in hydraulic system.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 5-25 to 5-37.

TIME:

6 Minutes

***TASK 2.15.15.2 REPLACE TURRET HARNESS CHANNEL COVER**

PARTS:	Channel cover (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Remove hull-turret slipring cover. (See Task 2.15.15.1)

MECHANIC WILL:

1. Unscrew and remove three screws and washers using socket and handle.
2. Lift off cover.
3. Inspect cover for damage.
4. If damaged, turn in and replace.
5. Put cover on stand-offs.
6. Screw in and tighten three screws and washers using socket and handle.

FOLLOW ON PROCEDURE:

1. Install hull-turret slipring cover.

REFERENCES:

DEP 9-2350-255-20-2-3-2.

TIME:

6 Minutes

MODULE:

COMPONENT:

PERFORMANCE OUTCOMES:

2.15.16.1 Replace left exterior stowage box assembly. (45 minutes)

(for each task)

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

End of Training: Accuracy - As indicated by:

B-48

TASK 2.15.16.1 REPLACE LEFT EXTERIOR STOWAGE BOX ASSEMBLY

PARTS:	Stowage box assembly (XM 66920)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, open end, 7/16 inch Hammer, hand, ball peen Punch, center Drill, electric, portable Drill, twist, 9/32 inch diameter Drill, twist, 5/16 inch diameter
EXPENDABLES:	Rag, wiping Chalk Pencil Tape, masking Paper, stiff

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Open box and remove bottle and other loose items.
2. Mark outline of box on turret with chalk.
3. Unscrew and remove eight screws, nuts, four straps, and 16 washers using wrench, socket, and handle.
4. Unscrew and remove two screws, nuts, straps, and four washers from rails using wrench, socket and handle.
5. Inspect straps for breaks, cracks, and twists.
6. If damaged, turn in and replace.
7. Unscrew and remove three screws, nuts, six washers, and one bracket for inside box using wrench, socket, and handle.
8. Take box out of rails.
9. Put paper over side of old box.
10. Line up paper with forward edge of box and bottom of hinge.
11. Tape paper in place with tape.
12. Draw three circles on paper with pencil over holes used for bottle bracket.

TASK 2.15.16.1 REPLACE LEFT EXTERIOR STOWAGE BOX ASSEMBLY (cont'd.)

13. Remove paper from box.
14. Turn in old box.
15. Align paper on new box in same position as on old box.
- 16.. Tape paper in place.
17. Center punch three holes using hammer and punch.
18. Drill three holes through paper and new box using 5/16 inch drill.
19. Remove paper and tape.
20. Put bottle bracket in box over holes.
21. Screw in and tighten three screws, nuts, and six washers using wrench, socket, and handle.
22. Put box on turret inside chalk lines.
23. Put strap on rail.
24. Hold in place and mark hole locations with pencil.
25. Center punch two holes using punch and hammer.
26. Drill two holes in box using 9/32 inch drill.
27. Screw in and tighten two screws, nuts, and four washers using wrench, socket, and handle.
28. Repeat steps 23 thru 27 until all straps are screwed on box.
29. Erase chalk with rag.
30. Replace contents of box.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 4-197 to 4-205.

TIME:

45 Minutes

APPENDIX C

HBC SYSTEM

LESSON PLAN OUTLINE

NBC SYSTEM

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 4 tasks in the NBC System module.

CONDITIONS: As described in the PRELIMINARY and FOLLOW ON PROCEDURES.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE:

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the students and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The procedures described under MECHANIC WILL for each task are derived from Task and Skill Analysis Report, Final, [XML] for the Tank, Combat, Full Tracked 105-MM Gun. Chrysler Corporation, 1979. There is a possibility that the procedures have changed with design changes in the XML. The procedures should be updated for the XML based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XML procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

¹Boldovici, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

NBC System (2.12)

COMPONENT:

Orifice and Hose Assembly (2.12.1)

PERFORMANCE OUTCOMES:

Mechanic will:

2.12.1.1 Replace NBC orifice assembly. (6 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

- Task 2.12.1.1 a. New orifice secured with new retaining ring.
- b. Coupling pushed into orifice.

TASK 2.12.1.1 REPLACE NBC ORIFICE ASSEMBLY

PARTS:	Orifice assembly (B5-19-1829) Ring, retaining (MS 16624-4087)
TOOLS:	Pliers, retaining ring
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: This procedure applies to commander's, gunner's, and loader's orifice assemblies.

1. Pull off coupling from orifice.
2. Remove retaining ring from orifice using pliers.
3. Discard ring.
4. Remove orifice.
5. Turn in defective orifice.
6. Put orifice through bracket.
7. Secure with new retaining ring using pliers.
8. Push coupling into orifice.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 6-3 and 6-4.

TIME:

6 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

NBC System (2.12)

COMPONENT:

Heater Unit (2.12.2)

PERFORMANCE OUTCOMES:

Mechanic will:

2.12.2.1 Replace NBC heater units. (18 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- | | |
|---------------|--|
| Task 2.12.2.1 | a. Screws holding heater in place torqued between 96 and 120 inch-pounds (11 to 14 newton meters). |
| | b. Solid hose attached to inlet adapter. |
| | c. Flexible hose attached to outlet adapter. |
| | d. Plugs connected to electrical leads according to tags on plugs. |

TASK 2.12.2.1 REPLACE NBC HEATER UNITS

PARTS:	Heater, air, electric (E5-19-1782)
TOOLS:	Screwdriver, flat tip Socket, socket wrench, 3/8 inch square drive, 7/16 inch Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, adjustable, 6 inch Wrench, box, 7/16 inch Wrench, torque, 0 to 200 inch-pounds
EXPENDABLES:	Tags, marking

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: Perform step 1 for gunner's heater only.
For commander's and loader's heaters,
begin with step 2.

1. Position main gun over left side of vehicle for access of gunner's heater through driver's compartment.
2. Pull apart three plugs from three electrical leads and tag plugs.
3. Unscrew two screws securing two hoses using screwdriver and pull off hoses.
4. Unscrew and remove four screws, washers, and one ground strap using box wrench or socket, extension, and handle as needed.
5. Remove heater.
6. Unscrew and remove two adapters using adjustable wrench.
7. Turn in defective heater.
8. Screw in and tighten two adapters to heater using adjustable wrench.
9. Hold heater in place.
10. Put ground strap under one screw and screw in and tighten four screws and washers using box wrench or socket, extension, and handle as needed.
11. Torque four screws between 96 and 120 inch-pounds (11 to 14 newton meters) using torque wrench.

TASK 2.12.2.1 REPLACE NBC HEATER UNITS (Cont'd.)

12. Push solid hose onto inlet adapter and screw in and tighten screw using screwdriver.
13. Push flexible hose onto outlet adapter and screw in and tighten using screwdriver.
14. Connect plugs to electrical leads according to tags on plugs.
15. Remove tags.

FOLLOW ON PROCEDURE:

1. Operate gas particulate filter and verify air is flowing to mask.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 6-5 to 6-8.

TIME:

18 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

NBC System (2.12)

COMPONENT:

Hose and Tube Assemblies (2.12.3)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.12.3.1 Replace NBC slipping tube assemblies. (24 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

- | | |
|---------------|--|
| Task 2.12.3.1 | a. Damaged parts replaced. |
| | b. New packing put in elbow. |
| | c. Elbow attached to NBC slipping. |
| | d. Tube attached to elbow and adapter. |
| | e. Hose attached to tube at elbow and adapter. |
| | f. New packing put in slipping. |

***TASK 2.12.3.1 REPLACE NBC SLIPRING TUBE ASSEMBLIES**

PARTS:	Adapter, straight (MS51843-30SS) Tube, loaders (NPN) Tube, gas filter (XM 66750)
TOOLS:	Screwdriver, flat tip Wrench, open end, 1 5/16 inch Wrench, open end, 1 1/2 inch
EXPENDABLES:	Packing, preformed (two required)

PRELIMINARY PROCEDURE:

1. Remove hull-turret slipring cover.

MECHANIC WILL:

1. Using screwdriver, loosen screw on clamp securing hose to tube and pull off hose.
2. Unscrew and remove tube from adapter using 1 1/2 inch wrench.
3. Unscrew and remove adapter and packing from slipring using 1 5/16 inch wrench.
4. Discard packing.
5. Using screwdriver, loosen screw on clamp securing hose to tube and pull off hose.
6. Unscrew and remove tube from elbow using 1 1/2 inch wrench.
7. Unscrew and remove elbow and packing from slipring using 1 5/16 inch wrench.
8. Discard packing.
9. Inspect parts for wear, cracks, dents, or stripped threads.
10. Turn in and replace any damaged parts.
11. Put new packing in elbow.
12. Screw in and tighten to slipring using 1 5/16 inch wrench.
13. Screw in and tighten tube to elbow using 1 1/2 inch wrench.
14. Push hose onto tube and secure with clamp and tighten screw using screwdriver.

***TASK 2.12.3.1 REPLACE NBC SLIPRING TUBE ASSEMBLIES (Cont'd.)**

15. Put new packing in slipring and screw in and tighten adapter using 1 5/16 inch wrench.
16. Screw in and tighten tube to adapter using 1 1/2 inch wrench.
17. Push hose onto tube and secure with clamp and tighten screw using screwdriver.

FOLLOW ON PROCEDURE:

1. Install hull-turret slipring cover.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 6-17 to 6-20.

TIME:

24 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

NBC System (2.12)

COMPONENT:

NBC Filter Assemblies (2.12.4)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.12.4.1 Replace NBC gas filters. (12 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

- | | |
|---------------|--|
| Task 2.12.4.1 | a. New filters placed on lower bracket. |
| | b. Upper bracket placed on filters. |
| | c. Sealing compound put on inside of elbows and outside of filter stubs. |
| | d. Hoses and clamps attached to elbows and lower stubs on filters. |

*** TASK 2.12.4.1 REPLACE NBC GAS FILTERS**

PARTS:	Filter, gas, 2 ea. (D5-19-2350)
TOOLS:	Knife, pocket Screwdriver, flat tip Wrench, combination, 7/16 inch
EXPENDABLES:	Sealing compound, general purpose, MIL-S-11-31

PRELIMINARY PROCEDURE:

1. Remove coaxial machinegun ready ammo box.

MECHANIC WILL:

1. Unscrew and remove four screws securing four hoses to two filters using screwdriver and pull off hoses.
2. Pry two elbows off two filters using screwdriver.
3. Unscrew and remove two screws from upper bracket using wrench and remove bracket.
4. Turn in two filters.
5. Scrape off old sealing compound from inside of two elbows using knife.
6. Put two filters on lower bracket.
7. Put upper bracket on filters and secure with two screws and washers using wrench.

WARNING: Many sealing compounds burn easily. Do not use near open fire. Use in well-ventilated area.

8. Put sealing compound on inside of elbows and outside of filter stubs.
9. Put elbows on filter stubs and allow sealing compound to harden.
10. Push two hoses and clamps onto two elbows.
11. Screw in and tighten two screws using screwdriver.
12. Push two hoses and clamps onto two lower stubs on filters.
13. Screw in and tighten two screws using screwdriver.

***TASK 2.12.4.1 REPLACE NBC GAS FILTERS (Cont'd.)**

FOLLOW ON PROCEDURE:

1. Install coaxial machinegun ready ammo box.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 6-9 to 6-12.

TIME:

12 Minutes

APPENDIX D
ARMAMENT SYSTEM

LESSON PLAN OUTLINE

ARMAMENT SYSTEM

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 7 tasks in the Armament System.

CONDITIONS: As described in the PRELIMINARY and FOLLOW ON PROCEDURES.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the students and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice on study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The procedures described under MECHANIC WILL for each task are derived from Task and Skill Analysis Report, Final, [XML] for the Tank, Combat, Full Tracked 105-MM Gun. Chrysler Corporation, 1979. There is a possibility that the procedures have changed with design changes in the XML. The procedures should be updated for the XML based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XML procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

Two tasks in this module have maintenance prerequisite tasks which can be taught according to the lesson plan outline for the module. Mechanics must be taught these prerequisite tasks before proceeding with the module. The prerequisite tasks and their corresponding module tasks are:

<u>Prerequisite Task</u>	<u>Module Task Number</u>
Drain FRH hydraulic fluid	2.18.1.3
Perform MRS update check	2.18.1.9

¹Boldovici, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

TASK 2.7.11.1 DRAIN HYDRAULIC RESERVOIR

PARTS:	Packing, preformed, 1 ea. (M83248-1-912) Packing, preformed, 1 ea. (NPN)
TOOLS:	Adapter, socket wrench, 3/8 inch to 3/4 inch square drive Extension, socket wrench, 3/4 inch square drive, 3 inch Handle, socket wrench, ratchet 3/8 inch square drive Handle, socket wrench, ratchet 3/4 inch square drive Socket, socket wrench, 3/8 inch square drive, 9/16 inch Socket, socket wrench, 3/8 inch square drive, 1-3/8 inch Wrench, adjustable Wrench, torque, 0 to 200 inch-pounds Pan, drain, 20 gallon
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Reduce system hydraulic pressure to zero (see remark 1).

MECHANIC WILL:

1. Unscrew and remove two screws and washers from access plate using 9/16 inch socket and handle.
2. Remove access plate.
3. Push in and twist chip collector to left and remove it.
4. Check chip collector for stripped threads or cracks. If damaged, replace part.
5. Discard packing.
6. Place pan under plug to catch fluid (18 gallons).
7. Unscrew and remove drain plug using 1-3/8 inch socket, extension, and handle. Allow hydraulic fluid to drain into pan.
8. Discard packing.
9. Inspect hydraulic fluid for dark color or metal chips and water. If found, purge hydraulic system.
10. Dispose of hydraulic fluid.
11. Screw plug and new packing into reservoir using 1-3/8 inch socket, extension, and handle.
12. Torque plug between 76 and 92 inch-pounds (9 to 10 newton meters) using torque wrench.
13. Put new packing on chip collector and twist into plug turning right until snug.

TASK 2.7.11.1 DRAIN HYDRAULIC RESERVOIR (cont'd.)

14. Put access plate on hull by screwing in and tightening two screws and washers using 9/16 inch socket and handle.
15. Torque two screws between 360 and 480 inch-pounds (41 to 54 newton meters) using torque wrench.
16. Traverse turret to gain access of reservoir.
17. Unscrew cap on filler plug.
18. Add hydraulic fluid.
19. Screw on cap on filler plug.

FOLLOW ON PROCEDURES:

1. Bleed hydraulic system
2. Operate gunner's power control handles

REFERENCES:

DEP 9-2350-255-20-1-3-3; pp. 8-21 to 8-24.

TIME:

63 Minutes.

TASK 1.

PERFORM MRS UPDATE CHECK

PARTS:	None
TOOLS:	None
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Power up gunner's station (see TM 9-2350-255-10; p. 2-145)
2. Perform computer self-test (see TM 9-2350-255-10; p. 2-163)

MECHANIC WILL:

NOTE A: Make sure main gun tube, turret and breech are clear.

NOTE B: Make sure turret power is on.

NOTE C: Make sure turret traverse lock is unlocked.

NOTE D: Make sure main gun elevation lock is unlocked.

1. Set GUN TURRET DRIVE switch on Loader's panel to POWERED position.
 2. Open gunner's primary sight (GPS) left ballistic door by grasping the left ballistic door handle, squeezing the lever on top and turning handle clockwise.
 3. Set computer control panel (CCP) power switch to ON position.
 4. Set the FIRE CONTROL MODE switch on GPS to NORMAL position and check that its indicator light come on.
 5. Set the MRS switch above the GPS to the IN position and check that MRS indicator light on the GPS become come on.
- NOTE E:** Do not press laser range buttons on power control handles.
6. Squeeze palm switch on power control handles to move main gun to zero elevation.
 7. Release palm switches.

TASK 1.

PERFORM MRS UPDATE CHECK (cont'd)

8. While looking through the GPS eyepiece, align the GPS reticle with the MRS reticle; move RETICLE ADJUST toggle switch on the CCP up (U), down (D), left (L), or right (R) as necessary to center the GPS reticle in the MRS reticle.
9. Set the MRS switch to the OUT position and check that the MRS indicator light goes out.

FOLLOW ON PROCEDURES:

1. Power down gunner's station.

REFERENCES:

TM 9-2350-265-10; pp 2-186 to 2-187

TIME:

___ minutes.

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Armament System (2.18)

COMPONENT:

105 mm Gun Mount Assembly (2.18.1)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.18.1.3 Replace 105 mm gun replenisher (45 minutes)

2.18.1.9 Align MRS to GPS daylight sight (42 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

Task 2.18.1.3	a. Hydraulic fluid pumped into replenisher until fluid reaches level mark. b. Replenisher centered on ceiling.
---------------	---

Task 2.18.1.9	a. MRS reticle centered with GPS reticle. b. GPS is aligned to daylight sight reticle.
---------------	---

***TASK 2.18.1.3 REPLACE 105MM GUN REPLENISHER**

PARTS:	Washer, lock, 8 ea. (NPN) Replenisher (XM65729)
TOOLS:	Screwdriver, flat tip Wrench, open end, 7/16 inch Wrench, adjustable 10 inch Pump, hydraulic, recoil mechanism, M-3
EXPENDABLES:	Fluid, hydraulic, FRH, MIL-H-46170 (6.5 gallons) Rags, wiping Plug, 7/16 inch (two required) Cap, 7/16 inch (two required) Solvent, cleaning, P-D-680, Type II

PRELIMINARY PROCEDURE:

1. Elevate main gun to maximum elevation.

MECHANIC WILL:

1. Unscrew and remove four screws and lockwashers securing replenisher to top of turret using open end wrench.
2. Discard lockwashers.
3. Take replenisher down from turret ceiling and put on gun mount.

CAUTION: Do not allow hydraulic oil to run out when fluid lines are disconnected.

4. Unscrew two nuts located on tee behind depression stop on main gun using adjustable wrench.
5. Pull two tubes out of tee.
6. Put two plugs into two tubes.
7. Put two caps on tee using adjustable wrench.
8. Remove replenisher from vehicle.
9. Drain oil from replenisher and dispose of oil.

WARNING: Solvent burns easily. Do not use near open flame.

***TASK 2.18.1.3 REPLACE 105MM GUN REPLENISHER (Cont'd.)**

10. Clean any spilled oil in vehicle with solvent and dry with rags.
11. Unscrew but do not remove eight screws in eight hose clamps on replenisher using screwdriver.
12. Remove three hoses.
13. Remove eight clamps from hoses and replenisher.
14. Remove two straps from replenisher.
15. Inspect all parts for cracks, wear, and leaks.
16. Feel hoses for soft spots and for dried-out spots.
17. Replace any damaged parts.
18. Unscrew and remove four screws and lockwashers securing four brackets to replenisher using open end wrench.
19. Discard lockwashers.
20. Remove four brackets.
21. Unscrew and remove two clamps from hose at replenisher using screwdriver.
22. Remove vent plug from hose and replenisher port.
23. Turn in damaged replenisher.
24. Put vent plug into hose.
25. Put two clamps on hose.
26. Put plug into rear port and tighten clamps with screwdriver.
27. Put four new lockwashers on screws.
28. Loosely screw in four screws to attach four brackets to replenisher tank.
29. Put straps on replenisher.
30. Put two hoses into forward ports of replenisher.
31. Wrap hose around replenisher and put curved tube and hose into other rear port.
32. Uncap tee using adjustable wrench.
33. Put tee into top hose.
34. Screw in and tighten nuts using wrench.
35. Put six clamps on three hoses securing with screw using screwdriver.
36. Put replenisher on ceiling of turret.
37. Secure with four screws and new lockwashers using open end wrench.

***TASK 2.18.1.3 REPLACE 105MM GUN REPLENISHER (Cont'd.)**

38. Center replenisher on ceiling.
39. Tighten eight screws on four brackets using open end wrench.
40. Remove hose from vent plug at rear port on replenisher by loosening clamp using screwdriver.
41. Using pump, pour hydraulic fluid into replenisher through vent plug until fluid meets level mark.
42. Put hose on vent plug and secure with clamp using screwdriver.
43. Clean any spilled fluid with solvent and dry with rags.

FOLLOW ON PROCEDURE:

1. Manually elevate main gun to zero position and install travel lock.

REFERENCES:

DEP 9-2350-255-20-2-32; pp. 7-31 to 7-36.

TIME:

45 Minutes

TASK 2.18.1.9 ALIGN MRS TO GPS DAYLIGHT SIGHT

PARTS:	None
TOOLS:	Muzzle reference sensor alignment tool XM63391 Screwdriver, flat tip
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Gunner's primary sight boresighted with main gun.
2. Turret lock set (see remark 2).
3. Gunner's primary sight day reticle is scaled.

MECHANIC WILL:

NOTE A: An assistant is required to adjust muzzle reference sensor and help mechanic.

1. Place following turret switches to position indicated:

<u>Switch Location</u>	<u>Switch Name</u>	<u>Position</u>
Commanders panel	Turret power	On
GPS	Fire control mode	Normal
CCP	Pwr.	On
GPS	Thermal test	Off
GPS	Gun select	Main
Loader's panel	Gun turret drive	Powered

2. Set turret to operate from auxiliary hydraulic power.
3. Set auxiliary hydraulic power switch on Commanders Panel to ON.
4. Position alignment tool in place on end of muzzle reference sensor.
5. Push in MRS button on computer control panel. (Numerical readout should be zero for both AZ and EL.)

NOTE B: All personnel must be clear of main gun for step 6.

6. Squeeze and hold gunner's power control palm switches. (Gun will move to level position.)
7. Release palm switches. (Gunner's primary sight will align with gun position.)
8. Push in boresight button on computer control panel. (MRS and boresight buttons should light up.)

TASK 2.18.1.9 ALIGN MRS TO GPS DAYLIGHT SIGHT (Cont'd.)

9. Adjust numerical readout for EL and AZ to 00 with switch on computer control panel.

NOTE C: Assistant should:

- a. Look through alignment tool.
- b. Line up reticle on gunner's primary sight head mirror. (Scent should enter gunner's primary sight.)
- c. Rotate muzzle reference sensor to get proper alignment.
- d. Using screwdriver, loosen four screws on muzzle reference sensor.
- e. Make final adjustment on GPS head mirror and tighten four screws.

NOTE D: Reticle on muzzle reference sensor will be seen in GPS.

10. Look through GPS and direct assistant to align muzzle reticle with gunner's primary sight day reticle.

NOTE E: Both reticles should be ± 4 mils in both azimuth and elevation modes.

11. Move reticle adjust toggle switch on computer control panel until two reticles seen in gunner's primary sight are in line with each other.

NOTE F: Assistant will take off muzzle reference sensor alignment tool.

12. Push ENTER pushbutton on computer control panel.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-10-1; pp. 2-131 to 2-132.

TIME:

45 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Armament System (2.18)

COMPONENT:

Grenade Launcher (2.18.2)

PERFORMANCE OUTCOMES:

Mechanic will:

2.18.2.1 Replace grenade launcher electrical harness covers. (30 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

- Task 2.18.2.1** a. Screws on harness covers torqued between 30 to 36 foot-pounds (40 to 48 newton meters).
- b. Screws on connector covers torqued between 70 to 84 foot-pounds (95 to 133 newton meters).

TASK 2.18.2.1 REPLACE GRENADE LAUNCHER ELECTRICAL HARNESS COVERS

PARTS:	Cover, left connector (NPN) Cover, left harness (NPN) Cover, right connector (NPN) Cover, right harness (NPN)
TOOLS:	Socket, socket wrench, 1/2 inch square drive, 9/16 inch Socket, socket wrench, 1/2 inch square drive, 3/4 inch Extension, socket wrench, 1/2 inch square drive, 6 inch Handle, socket wrench, ratchet, 1/2 inch square drive Wrench, torque, 0 to 175 foot-pounds
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Remove three screws and washers from right connector cover using 3/4 inch socket, extension, and handle.
2. Remove three screws and washers from right harness cover using 9/16 inch socket, extension, and handle.
3. Remove three screws and washers from left connector cover using 3/4 inch socket, extension, and handle.
4. Remove eleven screws and washers from left harness cover using 9/16 inch socket, extension, and handle.
5. Lift off covers.
6. Inspect covers for bends, breaks, or rust.
7. If defective, turn in and replace covers.
8. Put left harness cover in place.
9. Screw in and tighten eleven screws and washers using 9/16 inch socket extension, and handle.
10. Put left connector cover in place.
11. Screw in and tighten three screws and washers using 3/4 inch socket, extension, and handle.
12. Put right harness cover in place.
13. Screw in and tighten three screws and washers using 9/16 inch socket, extension, and handle.

TASK 2.18.2.1 REPLACE GRENADE LAUNCHER ELECTRICAL HARNESS COVERS (cont'd.)

14. Put right connector cover in place.
15. Screw in and tighten three screws and washers using 3/4 inch socket, extension, and handle.
16. Torque screws on harness covers between 30 and 36 foot-pounds (40 to 48 newton meters) using torque wrench.
17. Torque screws on connector covers between 70 and 84 foot-pounds (95 to 113 newton meters) using torque wrench.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-3; pp. 7-63 to 7-64.

TIME:

30 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Armament System (2.18)

COMPONENT:

Loader's Weapon Station (2.18.3)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.18.3.2 Replace Loader's machinegun mount holder assembly.
(16 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.18.3.2 a. Screws holding mount holder in place torqued between 96 and 132 inch-pounds (11 to 15 newton meters).
--

* TASK 2.18.3.2 REPLACE LOADER'S MACHINEGUN MOUNT HOLDER

PARTS:	Holder assembly (XM66626)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, open end, 7/16 inch Wrench, torque, 0 to 200 inch-pounds
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Remove loader's machinegun.

MECHANIC WILL:

1. Unscrew and remove three screws and nuts securing holder to ejection box using socket, handle and wrench.
2. Turn in defective holder.
3. Put holder in place and secure with three screws and nuts using socket, handle, and open end wrench.
4. Torque screws between 96 and 132 inch-pounds (11 to 15 newton meters) using torque wrench.

FOLLOW ON PROCEDURE:

1. Install loader's machinegun.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 7-69 to 7-71.

TIME:

6 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Armament System (2.18)

COMPONENT:

Coaxial Mount (2.18.4)

PERFORMANCE OUTCOMES:

Mechanic will:

2.18.4.11 Replace coaxial machinegun solenoid (15 minutes)

2.18.4.12 Adjust coaxial machinegun solenoid (15 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.18.4.11 a. Electrical plug screwed in at bottom of solenoid.

Task 2.18.4.12 a. No looseness between solenoid, lever, and trigger.
--

TASK 2.18.4.11 REPLACE COAXIAL MACHINEGUN SOLENOID

PARTS:	Solenoid, Coaxial (NPN) Washer, Lock, 2 ea. (NPN) Nut, Lock (MS51943-31)
TOOLS:	Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 7/16 inch Wrench, open end, 7/16 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Remove coaxial machine gun and accessory assembly.

MECHANIC WILL:

1. Unscrew and remove electrical plug from bottom of solenoid.
2. Unscrew and remove nut and screw at bottom of brackets under solenoid using socket, handle, and wrench.
3. Discard locknut.
4. Unscrew and remove two screws and lockwashers securing spacer to brackets using open end wrench.
5. Remove brackets and spacer.
6. Discard lockwashers.
7. Remove and turn in defective solenoid.
8. Put solenoid, spacer, and brackets in place.
9. Secure with two screws and new lockwashers using open end wrench.
10. Insert screw through holes in brackets under solenoid and screw on new locknut.
11. Tighten nut with socket, handle, and wrench.
12. Screw in and tighten electrical plug at bottom of solenoid.

FOLLOW ON PROCEDURES:

1. Install coaxial machine gun and accessory assembly.
2. Adjust firing solenoid. (See Task 2.18.4.12)

REFERENCES:

DEP 9-2350-255-2-3-2; pp. 7-111 to 7-113.

TIME:

15 Minutes

TASK 2.18.4.12 ADJUST COAXIAL MACHINEGUN SOLENOID

PARTS: None

TOOLS: Wrench, combination, 7/16 inch (two required)

EXPENDABLES: None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove electrical plug from bottom of solenoid.

WARNING: Be sure trigger is not pushed in after adjustment is made.

2. Using two wrenches, tighten screw and locknut on lever so there is no looseness between solenoid, lever, and trigger.
3. Screw in and tighten electrical plug to bottom of solenoid.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEF 9-2350-255-2-3-2; pp. 7-104 to 7-115.

TIME.

10 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Armament System (2.18)

COMPONENT:

Commander's Weapon Mount Assembly (2.18.5)

PERFORMANCE OUTCOMES:

Mechanic will:

2.18.5.3 Replace Commander's weapon mount equilibrator (48 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.18.5.3	a. Spring tension set in equilibrator to suit Tank Commander.
---------------	---

TASK 2.18.5.3 REPLACE COMMANDER'S WEAPON MOUNT EQUILIBRATOR

PARTS:	Equilibrator (XM66533)
TOOLS:	Pliers, slip joint Wrench, combination, 5/8 inch Wrench, combination, 3/4 inch Wrench, combination, 1 1/8 inch Diagonal cutters
EXPENDABLES:	Screw, safety, 3/8 inch Safety wire, 4 inch

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: An assistant is required to help mechanic.

1. Hold Commander's weapon level.
2. Direct assistant to move weapon up and down to align holes in equilibrator.
3. Put safety screw into holes and tighten using 5/8 inch wrench.
4. Install wire on safety screw as follows:
 - a. Put safety wire through hole in safety screw.
 - b. Bend upper end around screw.
 - c. Bend wire so upper end goes under lower end.
 - d. Ensure wire is tight around screw.
 - e. Twist wire ends to right until twisted part is 1/8 inch from hole in tab near safety screw on equilibrator. (Wire ends should have 8 to 10 turns per inch.)
 - f. Grip end of twisted part using pliers.
 - g. Pull and turn right until wire is tight.
 - h. Put upper end of wire through hole in tab.
 - i. Grip and pull end through hole using pliers.
 - j. Bend lower end of wire around tab.
 - k. Bend wire so upper end goes under lower end.
 - l. Pull tight and twist wire ends to left three turns using pliers.
 - m. Grip wires beyond twisted area with pliers and turn left while pulling three more turns.

TASK 2.18.5.3 REPLACE COMMANDER'S WEAPON MOUNT EQUILIBRATOR (Cont'd.)

- n. Cut wire with diagonal cutters at end of twisted area.
- o. Bend twisted end around tab.
- 5. Tell assistant to lower muzzle to lowest angle.
- 6. Open safety pin and slide out of stop.
- 7. Push stop up further into housing.
- 8. If stop will not go into housing to cover the lower pin hole, turn adjustment nut left a few turns using 1 1/8 inch wrench.
- 9. Turn screw to right using 1 1/8 inch wrench until stop moves into housing.
- 10. Put safety pin into lower hole of stop and hole of housing.
- 11. Tell assistant to support weapon near muzzle end and support equilibrator.
- 12. Unscrew and remove screw and washer using 3/4 inch wrench.
- 13. Pull back and down on equilibrator and take it off. (Screw and nut will stay on bracket.)
- 14. Inspect screw for stripped threads, worn head, bends, or breaks.
- 15. If damaged, discard and replace.
- 16. Inspect washer for breaks, bends, or gouges.
- 17. If damaged, discard and replace.
- 18. If equilibrator is defective, remove screw and nut from bracket and attach them to equilibrator.
- 19. Turn in equilibrator.

To Install:

- 20. If equilibrator is new, screw on new screw and nut to bracket.

NOTE B: New equilibrator will fit easier if screw and nut are put onto bracket the same number of turns as the old nut and screw were on bracket.

- 21. Tell assistant to support weapon near muzzle and support equilibrator until end of procedure.
- 22. Guide equilibrator into screw.
- 23. Put screw through bearing.
- 24. Put washer over screw and tighten screw into base using 3/4 inch wrench.

TASK 2.18.5.3 REPLACE COMMANDER'S WEAPON MOUNT EQUILIBRATOR (Cont'd.)

To prepare equilibrators for 50 caliber operation:

25. Look at stop. (Hole should be showing below housing.)

NOTE C: If hole can be seen, go to step 32. If hole cannot be seen, go to step 26.

26. Pull out safety pin.

27. Pull down on stop until hole in stop shows below housing.

28. If stop is up but will not come down, turn nut to left a few turns.

29. Turn screw to right using 1 1/8 inch wrench until stop can be pulled out of housing.

30. Put safety pin into hole in housing and into upper hole in stop.

31. Latch pin.

32. Cut wire using pliers.

33. Unscrew and remove safety screw while assistant slowly moves weapon up and down.

34. Set spring tension in equilibrators to suit Tank Commander by screwing screw in or out using 1 1/8 inch wrench.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 7-122 to 7-127.

TIME:

48 Minutes

APPENDIX E
HYDRAULIC SYSTEM

LESSON PLAN OUTLINE

HYDRAULIC SYSTEM

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 26 tasks in the Hydraulic System module.

CONDITIONS: As described in the PRELIMINARY and FOLLOW ON PROCEDURES.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the students and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The procedures described under MECHANIC WILL for each task are derived from Task and Skill Analysis Report, Final, [XML] for the Tank, Combat, Full Tracked 105-MM Gun. Chrysler Corporation, 1979. There is a possibility that the procedures have changed with design changes in the XML. The procedures should be updated for the XML based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XML procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

Nineteen tasks in this module have one or more maintenance prerequisite tasks which can be taught according to the lesson plan outline for the module. Mechanics must be taught these prerequisite tasks before preceeding with the module. The prerequisite tasks and their corresponding module tasks are:

<u>Prerequisite Task</u>	<u>Module Task Number</u>			
Zero hydraulic pressure	2.7.3.1	2.7.4.1	2.7.6.1	2.7.15.1
	2.7.3.2	2.7.4.2	2.7.7.1	2.7.15.2
	2.7.3.3	2.7.5.1	2.7.13.1	2.7.15.3
	2.7.3.8	2.7.5.2	2.7.14.1	2.7.17.1
				2.7.18.1

¹Boldovici, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

<u>Prerequisite Task</u>	<u>Module Task Number</u>			
Build up hydraulic pressure	2.7.3.1	2.7.4.1	2.7.6.1	2.7.15.1
	2.7.3.2	2.7.4.2	2.7.7.1	2.7.15.2
	2.7.3.3	2.7.4.3	2.7.7.5	2.7.15.3
	2.7.3.8	2.7.5.1	2.7.13.1	2.7.17.1
		2.7.5.2	2.7.14.1	2.7.18.1
Remove slipring cover	2.7.3.3			
Bleed main accumulator	2.7.15.1			

TASK G.O.3.29. CHECK HYDRAULIC ZERO PRESSURE AND BUILD UP HYDRAULIC PRESSURE

PARTS:	None
TOOLS:	None
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Power up TC station and turret.

MECHANIC WILL:

NOTE A: Make sure tank engine is shut down.

1. Set and hold AUX HYD POWER switch on TC's control panel to OFF position until AUX HYD POWER light goes off, then let go.

NOTE B: Make sure turret traverse lock is unlocked.

NOTE C: Make sure main gun elevation lock is unlocked.

2. Set GUN TURRET DRIVE switch on Loader's panel to POWERED position.
3. Set FIRE CONTROL MODE switch on Gunner's Primary Sight (GPS) lower panel to NORMAL or EMERGENCY and check that associated indicator lamp lights.
4. Check that GUN SELECT switch below GPS eyepiece is set at TRIGGER SAFE position and TRIGGER SAFE light is lit.
5. Grasp power control handles and squeeze either or both palm switches.
6. Pull the handles back to raise main gun and push handles forward to lower main gun.
7. Watch hydraulic pressure gage. Pressure should slowly decrease to 750-700 psi and then drop rapidly to zero pressure. If pressure drops rapidly above 750 psi or slowly below 700, hydraulic system needs correction.
8. Set and hold AUX HYD POWER switch on TC's control panel to ON position until AUX HYD POWER light comes on, then let go. Listen for hydraulic pump operation and check that pump shuts off when pressure reaches 1550-1650 psi.

FOLLOW ON PROCEDURES:

1. Power down TC station and turret.

TASK G.0.3.29. CHECK HYDRAULIC ZERO PRESSURE AND BUILD UP HYDRAULIC
PRESSURE (cont'd.)

REFERENCES:

TM 9-2350-255-10; pp. 2-111; 2-210; 2-167 to 2-168.

TIME:

___ Minutes.

TASK 2.15.15.1 REPLACE HULL-TURRET SLIPRING COVER

PARTS:	Washer, lock (NPN) Cover (NPN)
TOOLS:	Socket, socket wrench, 1/2 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 1/2 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Depress gun tube
2. Bleed off pressure in hydraulic system (See Task G.O.3.29.)
3. Remove turret platform shield/blanket

MECHANIC WILL:

1. Unscrew and remove four screws, lockwashers, and washers from slipring cover, using socket and handle.
2. Discard lockwashers.
3. Lift off cover.
4. Inspect cover for cracks or bends; if damaged, turn in and replace cover.
5. Put cover in place.
6. Screw in and tighten four screws, washers, and new lockwashers using socket and handle.
7. Torque screws between 30 and 36 foot pounds (40.5 to 48.5 newton meters) using torque wrench.

FOLLOW ON PROCEDURES:

1. Install turret platform shield/blanket
2. Build up pressure in hydraulic system

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 5-25 to 5-37.

TASK 2.7.15.5. BLEED MAIN ACCUMULATOR

PARTS:	None
TOOLS:	Wrench, open end, 1-1/8 inch Wrench, adjustable, 10 inch
EXPENDABLES:	Rags, wiping

PRELIMINARY PROCEFURES:

1. Engage turret lock.
2. Reduce system hydraulic pressure to zero (See Task G.O. 3.29).

MECHANIC WILL:

1. Put clean rags under fitting and loosen fitting using two wrenches.
2. Set VEHICLE MASTER POWER switch to ON.
3. Hold wrench on fitting and direct assisting soldier to set AUX HYDR POWER switch ON, and then OFF.
4. Look for fluid coming out of fitting. Tighten or loosen fitting as needed to get good leaking rate.

NOTE A: Fluid with air looks foamy. Fluid without air will be clear.

5. When fluid comes out clear, tighten fitting until fluid stops leaking from fitting using two wrenches.
6. Set VEHICLE MASTER POWER switch to OFF..

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir
2. Operate gunner's power control handles

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-117 to p. 2-119.

TIME:

12 minutes..

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Hydraulic Lines and Fittings (2.7.3)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.7.3.1 Replace gun elevation control hydraulic hose assemblies. (18 minutes)
- *2.7.3.2 Replace hydraulic pressure gage hoses and fittings. (24 minutes)
- 2.7.3.3 Replace slipring hydraulic lines, hoses, and fittings. (36 minutes)
- *2.7.3.8 Replace hydraulic pressure gage and adapter. (24 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

- | | |
|--------------|--|
| Task 2.7.3.1 | a. Hose connectors and packing not leaking, stripped, or cracked. |
| | b. Hoses attached on elbows at elevation servo and on nipples at power distribution valve. |

- | | |
|--------------|---|
| Task 2.7.3.2 | a. Parts not leaking, stripped or cracked. |
| | b. Damperer attached at power distribution valve. |
| | c. Bulkhead fitting attached. |

XM1 45E TURRET MECHANIC (Cont'd.)
COMPONENT OUTLINE

- d. Tube(s) attached at power distribution valve and bulkhead fitting in Driver's station.
- e. Tube attached to gage end in Gunner's station.

- Task 2.7.3.3
- a. Hose connectors and packing not leaking, stripped, or cracked.
 - b. Hose connectors attached on power distribution valve.
 - c. Unions attached on hoses.
 - d. Elbows and packings attached to slipring.
 - e. Tubes attached on unions and elbows.
 - f. Electrical plugs and receptacles uncapped.
 - g. Plugs screwed into slipring.

- Task 2.7.3.8
- a. Screws holding hydraulic pressure gage in place torqued between 96 and 120 inch-pounds (11 to 14 newton meters).
 - b. Hydraulic fluid that comes out of adapter tube fitting is clear.

***TASK 2.7.3.1 REPLACE GUN ELEVATION CONTROL HYDRAULIC HOSE ASSEMBLIES**

PARTS:	Hose, 2 ea. (NPN) Packing, preformed, 4 ea. (NPN)
TOOLS:	Extension, socket wrench, 1/2 inch square drive, 5 inch Handle, socket wrench, ratchet, 1/2 inch square drive Wrench, adjustable, 10 inch Wrench, open end, 1 1/2 inch Wrench, open end, 1 5/8 inch Tool kit, crowfoot wrenches, XM-J388
EXPENDABLES:	Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURES:

1. Center main gun over front of tank.
2. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

NOTE A: Position driver's seat fully down and headrest up to get to power distribution valve.

1. Unscrew and remove two hoses from connectors on top of power distribution valve using 1 1/2 inch open end and adjustable wrenches.
2. Unscrew and remove two hoses from elbows at elevation servo and two nipples at power distribution valve using 1 1/2 inch crowfoot wrench, extension, and handle.
3. Cap fittings.
4. Turn in defective hoses.
5. If hose connectors or packings are leaking, stripped, or cracked, go to step 6. If not go to step 14.
6. Unscrew and remove two connectors, nipples, and packings from power distribution valve using 1 5/8 inch open end wrench.
7. Discard packings and cap fittings.
8. Unscrew and remove two elbows, connectors, and packings at servo using 1 5/8 inch crowfoot wrench, extension, and handle.
9. Discard packings and cap fittings.
10. Turn in and replace defective parts.
11. Uncap fittings.

***TASK 2.7.3.1 REPLACE GUN ELEVATION CONTROL HYDRAULIC HOSE ASSEMBLIES (Cont'd.)**

12. Screw in and tighten two elbows, connectors, and packings using 1 5/8 inch crowfoot wrench, extension, and handle.
13. Screw in and tighten two connectors, nipples, and packings using 1 5/8 inch open end wrench.
14. Screw in and tighten two hoses on elbows at servo and on nipples at power distribution valve by hand.
15. Tighten hoses using 1 1/2 inch crowfoot wrench, extension, handle, and 1 1/2 inch and adjustable wrenches.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed air from elevation hydraulic system.
3. Operate gunner's power control handles.

REFERENCES:

DEP 9-2350-255-30-2-3-1; pp. 2-33 to 2-36.

TIME:

18 Minutes

***TASK 2.7.3.2 REPLACE HYDRAULIC PRESSURE GAGE HOSES AND FITTINGS**

PARTS:	Tube assembly (XM67487) Tube assembly (XM67462) Packing, preformed, 1 ea. (M83248-1-904)
TOOLS:	Wrench, open end, 9/16 inch Wrench, open end, 11/16 inch
EXPENDABLES:	Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURES:

1. Center main gun over front of tank.
2. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. From gunner's station, unscrew and remove tube from gage end using 9/16 inch wrench.
2. Cap gage.
3. From driver's compartment, unscrew two tubes connected at top bulkhead fitting using 9/16 inch wrench.
4. Unscrew and remove tube from power distribution valve using 9/16 inch wrench.
5. Turn in two damaged tubes.
6. Unscrew and remove dampener at power distribution valve using 9/16 inch wrench.
7. Discard packing and cap valve.
8. Unscrew and remove bulkhead fitting using 11/16 inch wrench.
9. Inspect parts for leaks, cracks, stripped threads, or ruptures. (If damaged, turn in and replace parts.)
10. Put new packing on dampener.
11. Uncap valve.
12. Screw in and tighten dampener on power distribution valve using 9/16 inch wrench.
13. Screw in and tighten bulkhead fitting using 11/16 inch wrench.
14. Screw in and tighten tube at power distribution valve and at bulkhead fitting using 9/16 inch wrench.

***TASK 2.7.3.2 REPLACE HYDRAULIC PRESSURE GAGE HOSES AND FITTINGS (Cont'd.)**

15. Screw in and tighten other tube at bulkhead fitting using 9/16 inch wrench.
16. From gunner's station, uncap gage end.
17. Screw in and tighten tube to gage end using 9/16 inch wrench.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed air from elevation hydraulic system.
3. Operate gunner's power control handles.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-37 to 2-39.

TIME:

24 Minutes

TASK 2.7.3.3 REPLACE SLIPRING HYDRAULIC LINES, HOSES, AND FITTINGS

PARTS:	Hose, 2 ea. (NPN) Packing, preformed, 4 ea. (NPN)
TOOLS:	Extension, socket wrench, 1/2 inch square drive, 17 inch Handle, socket wrench, ratchet, 1/2 inch square drive Measure, liquid, 8 quart Wrench, open end, 1 1/2 inch (two required) Wrench, adjustable, 10 inch Kit, tool, crowfoot, XM-J388
EXPENDABLES:	Caps and plugs, protective, MIL-C-5501 (assorted sizes) Rags, wiping

PRELIMINARY PROCEDURES:

1. Center main gun over front of tank.
2. Reduce system hydraulic pressure to zero.
3. Remove slipring cover.

MECHANIC WILL:

NOTE A: Check all parts for cracks, leaks, ruptures, fraying, stripped or cracked threads.
Replace as needed.

1. Put measure and rags around slipring to catch hydraulic fluid.
2. Unscrew and remove five electrical plugs from slipring by hand.
3. Cap plugs and receptacles.
4. Unscrew and remove two tubes from elbows on slipring using two open end wrenches.
5. Unscrew and remove two tubes from unions using 1 1/2 inch crowfoot wrench, extension, and handle and holding union with adjustable wrench.
6. Unscrew and remove two elbows and packings from slipring using adjustable wrench.
7. Discard packings and cap slipring.
8. Unscrew and remove two unions from two hoses using two open end wrenches.
9. Cap slipring.
10. Unscrew and remove two hoses from two hose connectors on power distribution valve using two open end wrenches.

TASK 2.7.3.3 REPLACE SLIPRING HYDRAULIC LINES, HOSES, AND FITTINGS (Cont'd.)

11. Cap valve.

NOTE B: Perform steps 12-15 only if hose connectors or packings on power distribution valve are leaking, stripped, or cracked.

- ~~12.~~ Unscrew and remove two hose connectors and packings from power distribution valve using two open end wrenches.
- 13. Discard packings.
- 14. Turn in and replace any damaged connectors.
- 15. Screw in and tighten two hose connectors and new packings using two open end wrenches.
- 16. Uncap power distribution valve.
- 17. Screw in and tighten two hoses on hose connectors on power distribution valve using two open end wrenches.
- 18. Screw in and tighten two unions on hoses using two open end wrenches.
- 19. Uncap slipring.
- 20. Screw in and tighten two elbows and new packings on slipring using adjustable wrench.
- 21. Screw in and tighten two tubes on two unions and on elbows using 1 1/2 inch crowfoot wrench, extension, and handle holding union with adjustable wrench.
- 22. Uncap five electrical plugs and receptacles.
- 23. Screw plugs onto slipring by hand.

FOLLOW ON PROCEDURES:

- 1. Fill hydraulic reservoir.
- 2. Bleed air from elevation hydraulic system.
- 3. Check for leaks. If any are found, do steps 16 thru 21 as needed.
- 4. Install slipring cover.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-40 to 2-44.

TIME:

36 Minutes

***TASK 2.7.3.8 REPLACE HYDRAULIC PRESSURE GAGE AND ADAPTER**

PARTS:	Gage, pressure (XM61580)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive, 6 inch Wrench, open end, 1/2 inch Wrench, open end, 9/16 inch Wrench, torque, 0 to 200 inch-pounds
EXPENDABLES:	Rags, wiping Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURE:

1. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. Unscrew tube fitting from adapter using 9/16 inch and 1/2 inch wrenches.
2. Cap tube.
3. Hold gage and unscrew and remove two screws and washers using socket, extension, and handle.
4. Unscrew and remove adapter using 1/2 inch wrench.
5. Turn in defective gage.
6. Screw in and tighten adapter to gage using 1/2 inch wrench.
7. Hold gage in place and secure with two screws and washers using socket, extension, and handle.
8. Torque screws between 96 and 120 inch-pounds (11 to 14 newton meters) using torque wrench.
9. Remove cap from tube fitting.
10. Screw in and tighten tube fitting using 9/16 inch and 1/2 inch wrenches.
11. Put rag under fitting.
12. Set TURRET POWER switch to ON.
13. Set AUX HYDR POWER switch to ON.
14. Allow pressure to build up to 250 psi, then turn AUX HYDR POWER switch to OFF.

***TASK 2.7.3.8 REPLACE HYDRAULIC PRESSURE GAGE AND ADAPTER (Cont'd.)**

15. Loosen fitting with 9/16 inch wrench until fluid comes out clear.
16. Tighten fitting using 9/16 inch and 1/2 inch wrenches.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Operate gunner's power control handles.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-140 to 2-142.

TIME:

24 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Azimuth Servo Assembly (2.7.4)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.7.4.1 Replace azimuth servo filter. (30 minutes)
- *#2.7.4.2 Replace azimuth servo assembly. (30 minutes)
- 2.7.4.3 Bleed air from azimuth hydraulic system. (15 minutes)
- 2.7.4.4 Check and adjust drift. (45 minutes)

MEASUREMENT:

(for each task)

- During Training: Time - Between end of initiating stimuli and completion of task.
- Accuracy - As indicated by match between steps indicated for task and steps performed by mechanic.
-
- End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
- Accuracy - As indicated by:

- | | |
|--------------|---|
| Task 2.7.4.1 | a. Screws holding filter onto adapter torqued evenly between 108 and 144° inch-pounds (12 to 16 newton meters). |
| | b. Hydraulic pressure gage indicates 1550-1650 pounds psi. |

- | | |
|--------------|---|
| Task 2.7.4.2 | a. Rings and packings in place on top of azimuth servo. |
| | b. Screws holding azimuth servo in place torqued between 90 and 100 foot-pounds (122 to 136 newton meters). |
| | c. Elbows and packings attached to line ends. |
| | d. Adapters and packings attached to hose ends. |

**XMI 45E TURRET MECHANIC (Cont'd.)
COMPONENT OUTLINE**

- e. Line ends attached to servo.
- f. Hose ends attached to servo.
- g. Electrical plugs attached to servo.

Task 2.7.4.3 a. Air removed from azimuth hydraulic system.

Task 2.7.4.4 a. GPS reticle not moving.

***TASK 2.7.4.1 REPLACE AZIMUTH SERVO FILTER**

PARTS:	Washer, lock, 4 ea. (MS35338-44) Packing, preformed, 2 ea. (MS38775-125) Retainer, 2 ea. (MS38774-125) Filter (11663155-2)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive, 12 inch Wrench, torque, 0 to 200 inch-pounds
EXPENDABLES:	Hydraulic fluid, MIL-H-46170, Amendment 1

PRELIMINARY PROCEDURES:

1. Traverse turret until access to servo can be made from driver's seat.
2. Reduce system hydraulic pressure to zero.

WARNING: System hydraulic system must be reduced to zero before starting this task (see preliminary procedures). Personal injury may result.

MECHANIC WILL:

1. Unscrew and remove four screws and lockwashers from adapter using socket, extension, and handle.
2. Discard lockwashers.
3. Take out adapter.
4. Remove and discard two packings and retainers.
5. Remove filter.
6. Turn in defective filter.
7. Put two new packings and retainers alternately onto adapter starting with a packing.
8. Place filter onto adapter.
9. Secure with four screws and new lockwashers using socket, extension, and handle.

***TASK 2.7.4.1 REPLACE AZIMUTH SERVO FILTER (Cont'd.)**

WARNING: Do not torque screws when equipment is under pressure. Personal injury may result.

10. Torque four screws evenly between 108 and 144 inch-pounds (12 to 16 newton meters) using torque wrench.
11. Service hydraulic reservoir.
12. Increase hydraulic pressure in the following increments waiting 45 seconds to 1 minute between steps. (Use auxiliary hydraulic pump.)

NOTE A: Turn off pump inbetween steps to prevent blowing out new filter with too much pressure too soon.

- . 0 to 300 pounds per square inch (psi).
- . 300 to 600 pounds psi.
- . 600 to 1000 pounds psi.
- . 1000 to between 1550 and 1650 pounds psi (operating pressure).

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-3 to 2-5.

TIME:

30 Minutes

***/#TASK 2.7.4.2 REPLACE AZIMUTH SERVO ASSEMBLY**

PARTS:	Azimuth servo assembly (P30761) Packing, preformed, 2 ea. (NPN) Packing, preformed, 2 ea. (NPN) Packing, preformed, 2 ea. (NPN) Ring, 2 ea. (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 3/4 inch Extension, socket wrench, 3/8 inch square drive, 12 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, open end, 1 1/2 inch Wrench, open end, 9/16 inch Wrench, torque, 0 to 175 foot-pounds Measure, liquid, 2 quart
EXPENDABLES:	Caps and plugs, protective, MIL-C-5501 (assorted sizes) Tags Pencil, lead

PRELIMINARY PROCEDURES:

1. Manually traverse
2. Remove basket screen.
3. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. Put liquid measure under servo to catch fluid.
2. Unscrew and remove two hydraulic line ends from bottom of servo using 9/16 inch wrench.
3. Tag lines.
4. Unscrew and remove two elbows and packings from line ends using 9/16 inch wrench.
5. Discard packings and cap lines.
6. Unscrew and remove two hydraulic hose ends from bottom of servo using 1 1/2 inch wrench.
7. Tag hoses.
8. Unscrew and remove two adapters and packings from hose ends using 1 1/2 inch wrench.
9. Discard packings and cap hoses.
10. Unscrew and pull off three electrical plugs from side and top of servo by hand.

***//TASK 2.7.4.2 REPLACE AZIMUTH SERVO ASSEMBLY (Cont'd.)**

CAUTION: Make sure servo is supported when removing last two screws and raising and lowering servo. Damage to internal tubing will occur if care is not taken.

11. Unscrew and remove seven screws and washers using socket, extension, and handle.
12. Carefully remove azimuth servo.
13. Remove two packings and rings from top of servo.
14. Discard packings and rings.
15. Turn in defective azimuth servo.
16. Put two new rings and packings in place on top of servo by hand.
17. Raise servo in place and screw in and tighten seven screws and washers using socket, extension, and handle.
18. Torque screws between 90 and 100 foot-pounds (122 to 136 newton meters) using torque wrench.

NOTE A: Remove caps from lines and hoses before installation.

19. Screw in and tighten two elbows and new packings to line ends using 9/16 inch wrench.
20. Screw in and tighten two adapters and new packings to hose ends using 1 1/2 inch wrench.
21. Screw on and tighten two line ends to servo using 9/16 inch wrench and remove tags.
22. Screw on and tighten two hose ends to servo using 1 1/2 inch wrench and remove tags.
23. Push on and tighten three electrical plugs to servo by hand.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed air from azimuth hydraulic system.
3. Check and adjust drift.
4. Operate gunner's control handles. Test lines for leakage and stabilization operation.
5. Install basket screen.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-6 to 2-9.

TIME:

30 Minutes

E-20

TASK 2.7.4.3 BLEED AIR FROM AZIMUTH HYDRAULIC SYSTEM

PARTS:	None
TOOLS:	None
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Unlock gun travel lock.
2. Start engine.
3. Unlock turret traverse lock.

MECHANIC WILL:

WARNING: Ensure all personnel and equipment are clear of main gun and turret throughout this procedure.
--

1. Set TURRET POWER switch on commander's control panel to ON.
2. Set FIRE CONTROL MODE switch on GPS panel to NORMAL.
3. Set GUN/TURRET DRIVE switch on loader's panel to POWERED.
4. Check that GUN SELECT switch on GPS panel is set to SAFE and TRIGGER SAFE light is on.
5. Set AUX HYDR POWER switch on commander's control to OFF.
6. Rotate top of gunner's handles back to elevate main gun to a position above about two degrees.
7. Turn handles to left so turret completes two revolutions to left.
8. Turn handles to right so turret completes two revolutions to right.

FOLLOW ON PROCEDURE:

1. Lock gun travel lock.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-10 to 2-13.

TIME:

15 Minutes

TASK 2.7.4.4 CHECK AND ADJUST DRIFT

PARTS:	None
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Screwdriver, flat tip, 1/8 inch flared tip, 2 inch long blade Wrench, box end, 15/64 inch Wrench, torque, 0 to 600 inch-pounds
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Distant target is available.
2. Unlock gun travel lock.
3. Unlock turret.

MECHANIC WILL:

1. Set TURRET POWER switch on commander's control panel to ON.
2. Set AUX H/DR POWER switch to ON.
3. Set FIRE CONTROL MODE switch on GPS panel to NORMAL.
4. Set GUN TURRET DRIVE switch on loader's panel to POWERED.
5. Grasp gunner's handles.
6. Look into GPS and line up convenient distant target.
7. With palm switch depressed and control handles centered, look through GPS.
8. If turret is drifting:
 - a. Push AZ knob in on NORMAL MODE DRIFT.
 - b. Turn AZ knob left to stop right drift.
 - c. Turn AZ knob right to stop left drift.
 - d. Let knob go when drift stops.
9. With palm switch depressed and control handles centered, look through GPS.

TASK 2.7.4.4 CHECK AND ADJUST DRIFT (Cont'd.)

10. If gun is drifting:
 - a. Push EL knob in on **NORMAL MODE DRIFT**.
 - b. Turn EL knob left to stop up drift.
 - c. Turn EL knob right to stop down drift.
 - d. Let knob go when drift stops.
11. Set **FIRE CONTROL MODE** switch on GPS panel to **EMER**.
12. Grasp gunner's handles.
13. Look into GPS and line up convenient target.
14. With palm switch depressed and control handles centered, look through GPS.
15. If gun or turret drifts, set **VEHICLE MASTER POWER** switch to **OFF** and complete steps 16 through 32.
16. Take off gunner's control handles and place in lap.
17. While seated in gunner's seat with control handles in lap, hook up cable 1W200 to control handles J1.
18. Set **TURRET POWER** switch on commander's control panel to **ON**.
19. Set **FIRE CONTROL MODE** switch on GPS to **EMER**.
20. Set **GUN TURRET DRIVE** switch on loader's panel to **POWERED**.
21. Look through GPS and line up convenient distant target.
22. Depress palm switch on gunner's handles.
23. Relay reticle on aiming point.
24. If turret is drifting:
 - a. Loosen locknut using 15/64 inch box end wrench.
 - b. Adjust variable resistor marked T on back of handle using screwdriver until drift stops.
 - c. If drift cannot be stopped completely, the drift rate should not be greater than one reticle circle (1 MIL) in 20 seconds when referenced to a verticle line on the target.
25. Relay reticle on a clearly defined aiming point.
26. If gun is drifting:
 - a. Loosen locknut using 15/64 inch box end wrench.
 - b. Adjust variable resistor marked E on back of handle using screwdriver until drift stops.
 - c. If drift cannot be stopped completely, the drift rate should not be greater than one reticle circle (1 mil) in 20 seconds when referenced on a horizontal line on the target.

TASK 2.7.4.4 CHECK AND ADJUST DRIFT (Cont'd.)

27. Relay reticle on a clearly defined aiming point.
28. While keeping gunner's control handle palm switch depressed, check for drift.
29. If any drift is detected, repeat steps 22-24, or 23, 25-26, or both.
30. Set VEHICLE MASTER POWER switch on commander's control panel to OFF.
31. Set AUX HYDR POWER switch to OFF.
32. Disconnect electrical plug from gunner's control handle.

FOLLOW ON PROCEDURES

1. Install gunner's control handles.
2. Check for proper operation of gunner's control handle.
3. Lock gun travel lock.
4. Lock turret.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-14 to 2-20.

TIME:

45 Minutes

**XMI 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Elevation Servo Assembly (2.7.5)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.7.5.1 Replace elevation servo. (18 minutes)
- *2.7.5.2 Replace elevation servo filter. (9 minutes)

MEASUREMENT:

(for each task)

During Training:

- Time - Between end of initiating stimuli and completion of task.
- Accuracy - As indicated by match between steps indicated for task and steps performed by mechanic.

End of Training:

- Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
- Accuracy - As indicated by:

- | | |
|--------------|---|
| Task 2.7.5.1 | a. Screws holding elevation servo in place torqued between 90 and 100 foot-pounds (122 to 136 newton meters). |
| | b. Elbow and packing attached. |
| | c. Electrical plugs attached. |
| | d. Line ends attached to elbows on servos. |

- | | |
|--------------|--|
| Task 2.7.5.2 | a. Screws holding adapter to elevation servo torqued between 18 and 23 foot-pounds (24 to 31 newton meters.) |
|--------------|--|

***TASK 2.7.5.1 REPLACE ELEVATION SERVO**

PARTS:	Washer, lock, 6 ea. Elevation servo (p30762)
TOOLS:	Crowfoot, socket wrench, 1/2 inch square drive, 1 1/2 inch Crowfoot, socket wrench, 1/2 inch square drive, 1 5/8 inch Handle, socket wrench, ratchet, 1/2 inch square drive Measure, liquid, 2 quart Extension, socket wrench, 1/2 inch square drive, 5 inch Extension, socket wrench, 1/2 inch square drive, 17 inch Wrench, torque, 0 to 175 foot-pounds Web strap, adjustable XM 66899
Expendables:	Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURES:

1. Reduce system hydraulic pressure to zero.
2. Traverse turret to see elevation servo.
3. Remove turret ammunition rack.
4. Remove computer electronics unit.

MECHANIC WILL:

1. Unscrew and remove three electrical plugs by hand.
2. Put measure under servo.
3. Unscrew and remove two line ends from servo using 1 1/2 inch crowfoot, extension, and handle.
4. Cap lines.
5. Unscrew and remove elbow and packing near top of servo using 1 5/8 inch crowfoot, extension, and handle.
6. Discard packing.
7. Attach adjustable web strap to servo.
8. Unscrew and remove six screws and lockwashers from servo using 3/4 inch socket and handle.
9. Discard lockwashers.
10. Lower servo using strap.

WARNING: Servo requires two soldiers to lift it.

11. Lift servo out through loader's hatch using web strap.

***TASK 2.7.5.1 REPLACE ELEVATION SERVO (Cont'd.)**

12. Discard two packings.
13. Turn in defective servo.
14. Install two new packings on servo.
15. Using web strap, lower servo through loader's hatch.
16. Secure servo in place with six screws and new lock-washers using 3/4 inch socket and handle.
17. Torque screws between 90 and 100 foot-pounds (122 to 136 newton meters) using torque wrench.
18. Screw in and tighten elbow and new packing using 1 5/8 inch crowfoot, extension, and handle.
19. Push on and tighten three electrical plugs by hand.
20. Remove caps from line ends.
21. Screw in and tighten two line ends to elbows on servo using 1 1/2 inch crowfoot, extension, and handle.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed air from elevation hydraulic system.
3. Install computer electronics unit.
4. Install turret ammunition rack.
5. Check and adjust drift.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-21 to 2-25.

TIME:

18 Minutes

***TASK 2.7.5.2 REPLACE ELEVATION SERVO FILTER**

PARTS: Washer, lock, 4 ea. (MS35338-44)
Filter (11663155-2)
Packing, preformed, 2 ea. (MS28775-125)
Retainer, 2 ea. (MS28774-125)

TOOLS:

Socket, socket wrench, 1/2 inch square drive, 7/16 inch
Handle, socket wrench, ratchet, 1/2 inch square drive
Wrench, torque, 0 to 175 foot-pounds

EXPENDABLES:

Rags, wiping

PRELIMINARY PROCEDURES:

1. Reduce system hydraulic pressure to zero.
2. Lock turret lock.

MECHANIC WILL:

1. Unscrew and remove four screws and lockwashers from adapter using socket and handle.
2. Discard lockwashers.
3. Remove adapter, two packings, and retainers.
4. Discard packings and retainers.
5. Unscrew and remove filter. (Use rags to clean any spilled oil.)
6. Turn in defective filter.
7. Screw in new filter.
8. Put new packings and retainers on adapter.
9. Align holes of adapter with holes on elevation servo.
10. Secure with four screws and new lockwashers using socket and handle.

WARNING: Do not torque screws when equipment is under pressure.

11. Torque four screws between 18 and 23 foot-pounds (24 to 31 newton meters) using torque wrench.

***TASK 2.7.5.2 REPLACE ELEVATION SERVO FILTER (Cont'd.)**

FOLLOW ON PROCEDURES:

1. Operate gunner's power control handles.
2. Fill hydraulic reservoir.
3. Bleed air from elevation hydraulic system.
4. Increase hydraulic pressure.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-30 to 2-32.

TIME:

9 Minutes

**XMI 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Elevation Accumulator Assembly (2.7.6)

PERFORMANCE OUTCOMES:

Mechanic Will:

***2.7.6.1 Replace manual elevation accumulator assembly (18 minutes)**

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- | |
|---|
| <p>Task 2.7.6.1</p> <ul style="list-style-type: none">a. Clamp nuts holding accumulator in place torqued between 27 and 32 inch-pounds (3 to 4 newton meters).b. Hydraulic fluid that comes out of tube fitting under accumulator is clear. |
|---|

***TASK 2.7.6.1 REPLACE MANUAL ELEVATION ACCUMULATOR ASSEMBLY**

PARTS:	Accumulator, manual elevation (7974982) Packing, preformed, 1 ea. (M83248-1-908)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 3/8 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, open, 1 1/8 inch Wrench, open end, 9/16 inch Wrench, torque, 0 to 200 inch-pounds
EXPENDABLES:	Rags, wiping Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURE:

1. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. Close spicket valve located near turret wall, below and left of accumulator, about one foot off floor.
2. Place rag under tube fitting under accumulator and unscrew tubing nut using 9/16 inch wrench and disconnect tubing from bottom of accumulator.
3. Cap tube fitting.
4. Unscrew two nuts from clamp using socket and handle.
5. Lift out accumulator from bracket and place on workbench.
6. Unscrew and remove reducer and packing using 1 1/8 inch wrench.
7. Discard packing.
8. Turn in defective accumulator.
9. Clean reducer with rag.
10. Install new packing on reducer without twisting packing.
11. Screw in and tighten reducer on accumulator using 1 1/8 inch wrench.
12. Uncap tube fitting.
13. Hold accumulator in place and screw on tube fitting finger tight.
14. Screw on and tighten two clamp nuts using socket and handle.
15. Torque between 27 and 32 inch-pounds (3 to 4 newton meters) using torque wrench.

***TASK 2.7.6.1 REPLACE MANUAL ELEVATION ACCUMULATOR ASSEMBLY (Cont'd.)**

16. Open T-valve.
17. Look at fluid coming past tube fitting and tighten fitting when fluid comes out clear using 9/16 inch wrench.
18. Wipe up fluid with rags.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed hydraulic system.
3. Operate main gun with hand pump.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-99 to 2-101, and 2-105.

TIME:

18 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Hydraulic System (2.7)

COMPONENT:

Manual Elevation Handle Pump Assembly (2.7.7)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.7.7.1 Replace elevation hand pump handle assembly. (12 minutes)
- 2.7.7.5 Bleed air from manual elevation hydraulic system. (1 hour)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

Task 2.7.7.1 a. New elevation hand pump handle assembly installed.

Task 2.7.7.5 Air removed from manual elevation hydraulic system as indicated by:

- a. Accumulator pressure gage reads zero.
- b. No air in hydraulic line marked MD on elevation servo.
- c. No air in hydraulic line marked ME on elevation servo.

***TASK 2.7.7.1 REPLACE ELEVATION HAND PUMP HANDLE ASSEMBLY**

PARTS:	Handle assembly (XM61437-1)
TOOLS:	Hammer, hand, ball peen Pliers Punch, drive pin, 1/4 inch point
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove plug.
2. Tap out pin from handle assembly using hammer and drive pin.
3. Pull out pin with pliers.
4. Pull handle assembly off shaft.
5. Turn in defective handle assembly.
6. Slide handle assembly on to end of shaft.
7. Line up hole in handle assembly with hole in shaft.
8. Tap pin into hole using hammer.
9. Screw in and tighten plug.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-2-1; pp.2-73 to 2-74.

TIME:

12 Minutes

TASK 2.7.7.5 BLEED AIR FROM MANUAL ELEVATION HYDRAULIC SYSTEM

PARTS:	None
TOOLS:	Wrench, open end, 9/16 inch
EXPENDABLES:	Rags, wiping

PRELIMINARY PROCEDURES:

1. Remove turret shield and screen.
2. Start engine.

MECHANIC WILL:

NOTE A: Make sure area around turret is clean.

1. Set TURRET POWER switch to ON.
2. Set FIRE CONTROL MODE switch to normal.
3. Set GUN TURRET DRIVE switch to POWERED.
4. Set AUX HYDR POWER switch to OFF.
5. Engage turret lock.
6. Unlock main gun travel lock.
7. Squeeze gunner's control handles palm switch with right hand while simultaneously turning elevation hand pump right, then left with left hand.
8. Release gunner's control handles and turn pump to elevate and depress main gun.
9. If main gun does not elevate and depress using hand pump, repeat steps 7 and 8.

NOTE B: Shut down engine.

10. Set TURRET POWER switch to ON.
11. Set FIRE CONTROL MODE switch to EMER.
12. Set GUN TURRET DRIVE switch to POWERED.
13. Set AUX HYDR POWER switch to OFF.

NOTE C: Make sure area around turret is clear.

14. Use gunner's control handles to elevate and depress main gun until accumulator pressure is zero.
15. Make sure pressure gage reads zero.
16. Unlock turret lock.

TASK 2.7.7.5 BLEED AIR FROM MANUAL ELEVATION HYDRAULIC SYSTEM (Cont'd.)

17. Traverse turret until elevating servo is accessible from driver's compartment.
18. Engage turret lock.
19. Use hand pump to fully elevate main gun.

NOTE D: Use plenty of rags around elevating servo and on turret floor to soak up oil.

NOTE E: The effort required to crank hand pump will increase until air is completely removed from the system. The effort will become constant when air is removed.

20. Open hydraulic line marked MD on elevation servo about 1/2 turn while slowly cranking hand pump to depress gun. (Use wrench.)
21. Tighten hydraulic line when air stops coming out while slowly cranking hand pump. (Use wrench.)
22. Slowly elevate main gun with hand pump.
23. Repeat steps 20 thru 22 for hydraulic line marked ME on elevation servo.
24. Repeat steps 20 thru 23 to make sure all air is removed from elevating mechanism.

FOLLOW ON PROCEDURES:

1. Bleed air from elevating mechanism.
2. Install turret basket shield and screen.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-88 to 2-94.

TIME:

1 Hour

XM1 45E TURRET MECHANIC COMPONENT OUTLINE

MODULE:

Hydraulic System (2.7)

COMPONENT:

Elevation Mechanism (2.7.8)

PERFORMANCE OUTCOMES:

Mechanic will:

2.7.8.1 Replace elevation mechanism struts. (12 minutes)

MEASUREMENT:

(for each task)

During Training:

- Time** - Between end of initiating stimuli and completion of task.
- Accuracy** - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

- Task 2.7.8.1**
- a. Screws holding support on strut torqued between 150 and 180 foot-pounds (203 to 244 newton meters).
 - b. Lower nut holding strut at bracket torqued between 350 and 400 foot-pounds (475 to 542 newton meters).

TASK: 2.7.8.1 REPLACE ELEVATION MECHANISM STRUTS

PARTS:	Strut (XM 61322) Strut (XM 61959) Support, 2 ea. (XM 61885)
TOOLS:	Socket, socket wrench, 3/4 inch square drive, 1 1/2 inch Socket, sock wrench, 3/4 inch square drive, 15/16 inch Handle, socket wrench, ratchet, 3/4 inch square drive Wrench, open end, 1 1/2 inch Wrench, torque, 0 to 600 foot-pounds Oiler, hand
EXPENDABLES:	Oil, lubricating, OE/HDO-30, MIL-L-2104 Threadlocking compound, MIL-S-46163, type II, grade N Rags, wiping

PRELIMINARY PROCEDURE:

1. Remove coaxial ready ammunition door.

MECHANIC WILL:

NOTE A: This procedure applies to both struts.

1. Hold support at top of strut and unscrew and remove two screws and washers using 15/16 inch socket and handle.
2. Let support slide down strut.
3. Unscrew and remove one nut and washer at bottom of strut using 1 1/2 inch wrench.
4. Lift out strut and support.
5. Unscrew and remove one nut and washer from strut.
6. Remove support from strut.
7. Inspect strut and support for cracks and stripped threads.
8. Turn in and replace damaged part.
9. Spread oil on strut threads with oiler.
10. Wipe off extra oil with rag.
11. Slide support on strut.
12. Screw one nut and washer on strut threads by hand.
13. Put strut into bracket.
14. Spread compound on two screws.
15. Hold support in place.

TASK 2.7.8.1 REPLACE ELEVATION MECHANISM STRUTS (Cont'd.)

16. Secure with two screws and washers using 15/16 inch socket and handle.
17. Torque two screws between 150 and 180 foot-pounds (203 to 244 newton meters) using torque wrench.
18. Screw one nut and washer onto strut at bracket.
19. Holding upper nut with open end wrench, torque lower nut between 350 and 400 foot-pounds (475 to 542 newton meters) using torque wrench.

FOLLOW ON PROCEDURE:

1. Install coaxial ready ammunition box.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-6 to 2-29.

TIME:

12 Minutes

MODULE:

COMPONENT:

PERFORMANCE OUTCOMES:

2.7.9.1 Adjust backlash setting. (6 minutes)

MEASUREMENT:

(for each task)

During Training:

- Time** - Between end of initiating stimuli and completion of task.
- Accuracy** - As indicated by match between steps indicated for each task and steps performed by mechanic.

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

End of Training: Accuracy - As indicated by:

E-40

TASK 2.7.9.1 ADJUST BACKLASH SETTING

PARTS:	None
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive, 3 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Remove cover from traverse gearbox by hand.
2. Loosen adjusting screw to the left using socket, extension, and handle.

NOTE A: The contact point is when the anti-backlash pinion contacts the turret drive ring. Contact point will be indicated when adjusting screw suddenly gets harder to turn.

3. Turn adjusting screw right to contact point using socket, extension, and handle.
4. Tighten adjusting screw six or seven more turns after contact point is reached.
5. Put cover on traverse gearbox.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-34-2-2-1; p. 2-54.

TIME:

6 Minutes

**XMI 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Traverse Mechanism (2.7.10)

PERFORMANCE OUTCOMES:

Mechanic will:

2.7.10.2 Service traverse mechanism. (15 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.7.10.2	Aa. Operational test verifies manual cranking is smooth.
	Ab. Oil level = covers head of screw seen through filler-breather plug.
	Ba. Operational test verifies manual cranking is smooth.
	Bb. Oil level covers head of screw seen through filler-breather plug.

TASK 2.7.10.2 SERVICE TRAVERSE MECHANISM

PARTS:	Packing, preformed, 1 ea.
TOOLS:	Socket, socket wrench, 3/4 inch square drive, 1 inch Handle socket wrench, ratchet, 3/4 inch square drive Socket, socket wrench, 1/2 inch square drive, 1 inch square drive, 9/16 inch Adapter, 3/4 to 1/2 inch Funnel
EXPENDABLES:	Rag, clean Oil, traversing mechanism, P33672, 1 quart Container, 2 quart

PRELIMINARY PROCEDURES:

None

MECHANIC WILL: (Perform both Part A and Part B)

A. Oil Level Check:

1. Place circuit breaker 17 in turret networks box to OFF.
2. Clean housing around filler-breather plug using rag.
3. Remove filler-breather plug using 1 inch socket and handle.
4. Look into plug hole and see if oil level covers head of screw.

NOTE A: If oil level is below screw head, add oil as required through plug hole.

5. Install filler-breather plug using 1 inch socket and handle.
6. Clean housing around plug using rag.
7. Place circuit breaker 17 in turret networks box to ON.
8. Perform operational test to verify that manual cranking is smooth.

B. Draining Oil:

1. Place circuit breaker 17 on turret networks box to OFF.
2. Set container below drain plug.
3. Remove drain plug using 9/16 inch socket, adapter, and handle.
4. Let oil drain into container.

TASK 2.7.10.2 SERVICE TRAVERSE MECHANISM (Cont'd.)

5. Remove and discard packing.
6. Lubricate new packing with oil and position on drain plug.
7. After oil has completely drained, install drain plug using 9/16 inch socket, adapter, and handle.
8. Clean housing around drain plug and around filler-breather plug using clean rag.
9. Remove filler-breather plug using 1 inch socket and handle.
10. Put funnel into hole and pour in enough oil to cover head of screw seen through the filler-breather hole.
11. Install filler-breather plug using 1 inch socket and handle.
12. Clean housing around filler-plug hole using rag.
13. Place circuit breaker 17 to ON.
14. Perform operational test to verify that manual cranking is smooth.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DLO 9-2350-255-12, Card 7.

TIME:

15 Minutes

**XM1 45 E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Hydraulic Reservoir (2.7.11)

PERFORMANCE OUTCOMES:

Mechanic will:

2.7.11.2 Inspect hydraulic reservoir. (1 hour, 24 minutes)

2.7.11.4 Replace reservoir sight gage. (30 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

Task 2.7.11.2	a. Hydraulic reservoir does not leak.
	b. Hydraulic reservoir sight gage is not loose or cracked.
	c. Filter housing elements replaced.
	d. Filler plug tight and not damaged.
	e. Screen in filler plug clean with no holes or cracks.
	f. Metal chips appear on less than half of surface of chip collector.
	g. Hydraulic reservoir drain plug torqued between 76 and 92 inch-pounds (9 to 10 newton meters).

Task 2.7.11.4	a. New reservoir sight gage installed.
	b. Screws holding reservoir sight gage in place torqued between 27 and 32 inch-pounds (3 to 4 newton meters).

TASK 2.7.11.2 INSPECT HYDRAULIC RESERVOIR

PARTS:	Element (NPN) Packing, preformed, 2 ea. (NPN)
TOOLS:	Brush, sash Flashlight Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 9/16 inch Wrench, torque, 0 to 600 inch-pounds Wrench, torque, 0 to 200 inch-pounds Wrench, open end, 1 1/2 inch
EXPENDABLES:	Solvent, cleaning, P-D-680, Type II Rags, wiping

PRELIMINARY PROCEDURES:

1. Position main gun over right front fender.
2. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. Remove shield from hydraulic reservoir by loosening four screws using socket and handle.
2. Lift up and remove shield from screws.
3. Inspect hydraulic reservoir for oil leakage.
4. If leak is from crack in reservoir, notify direct support maintenance.
5. Inspect hydraulic sight gage.
6. Replace if loose or cracked. (See Task 2.7.11.4.)
7. Remove filter housing using open end wrench.

WARNING: Solvent burns easily. Do not use near open fire.
--

8. Remove element from filter housing and discard element.
9. Clean filter housing with solvent and rag.
10. Wipe with lint free rag.
11. Put new element into filter housing.
12. Screw filter housing into filter body hand tight.
13. Tighten using open end wrench.

TASK 2.7.11.2 INSPECT HYDRAULIC RESERVOIR (Cont'd.)

NOTE A: Repeat steps 7 thru 13 for second filter housing.

14. Turn filler cap left and lift off.
15. Check filler plug.
16. If loose, tighten using socket and handle. If damaged, replace plug.
17. Using flashlight, inspect screen in filler plug.
18. If holes or cracks are found, replace filler plug. If screen is dirty, perform the following:
 - a. Remove plug.
 - b. Remove and discard packing.
 - c. Clean filler plug using solvent.
 - d. Screw in and tighten filler plug and new packing.
19. Place filler cap on plug and turn cap right until tight.
20. Drain hydraulic reservoir.
21. Inspect bottom of chip collector for metal chips.
22. If metal chips appear on more than half of surface, clean off chips and change oil.
23. Install drain plug, chip collector, and access cover.
24. From underneath tank, remove two screws and washers from access cover using socket and handle.
25. Using flashlight, inspect bottom of reservoir for signs of leakage.
26. If leak is from crack in reservoir, notify direct support maintenance.
27. If reservoir is leaking, torque drain plug between 76 and 92 inch-pounds (9 to 10 newton meters) using torque wrench.
28. Inside turret, put shield in place and tighten four screws using socket and handle.
29. Replace vent filter assembly.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Operate gunner's power control handles and check for leaks.

REFERENCES:

DEP 9-2350-255-20-1-1; pp. 2-43 to 2-48.

TIME:

1 Hour, 24 Minutes

TASK 2.7.11.4 REPLACE RESERVOIR SIGHT GAGE

PARTS:	Gage, sight (XM6350)
TOOLS:	Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 5/16 inch Wrench, torque, 0 to 200 inch-pounds
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Position main gun over right front fender.

MECHANIC WILL:

1. Drain reservoir fluid level slowly until level is below gage.
2. Unscrew and remove six screws and washers from gage using socket and handle.
3. Turn in defective gage.
4. Put gage in place and secure with six screws and washers using socket and handle.
5. Torque screws between 27 and 32 inch-pounds (3 to 4 newton meters) using torque wrench.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Operate gunner's power control handles.

REFERENCES:

DEP 9-2350-255-20-1-3-3; pp. 8-29 to 8-30.

TIME:

30 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Hydraulic System (2.7)

COMPONENT:

Electrically Driven Hydraulic Pump (2.7.12)

PERFORMANCE OUTCOMES:

Mechanic will:

2.7.12.3 Troubleshoot auxiliary hydraulic pump fault symptom-
(2 hours, 30 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.7.12.3 a. Auxiliary hydraulic system operates.

TASK 2.7.12.3 TROUBLESHOOT AUXILIARY HYDRAULIC PUMP FAULT SYMPTOM

PARTS:	None
TOOLS:	Multimeter, TS-352B/U
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Open turret platform access door.
2. Traverse turret manually until auxiliary hydraulic pump is visible through access door.

MECHANIC WILL:

1. Check that cable 2W112-P2 is securely connected to auxiliary hydraulic pump.
 2. Check that cable 2W112-P3 is securely connected to auxiliary pressure switch.
- NOTE A: If connectors are loose, do steps 3 and 4. If connectors are not loose, go to step 5.
3. Tighten loose connectors.
 4. Verify trouble solved by operating power control power using auxiliary hydraulic system.
 5. Disconnect cable 2W112-P3 from J1 on auxiliary hydraulic pressure switch.

6. Set TURRET POWER switch on commander's control panel to ON.
7. Set AUX HYDR POWER switch to ON.
8. Set multimeter to measure 50 VDC.

9. Connect red multimeter lead to pin P3-B on cable 2W112 and connect black multimeter lead to ground.

NOTE B: If meter reads between 18 and 30 VDC, go to step 13. If not, go to step 10.

10. Close CB-13 on hull networks box.
11. Reconnect cable 2W112-P3 to auxiliary hydraulic pressure switch.
12. Verify trouble solved by operating auxiliary hydraulic system.

TASK 2.7.12.3 TROUBLESHOOT AUXILIARY HYDRAULIC PUMP FAULT SYMPTOM (cont'd.)

13. Manually traverse turret to access hull networks box from turret.
14. Disconnect cable 2W112-P1 from J5 on hull networks box.
15. Set multimeter to measure 50 VDC.
16. Connect red multimeter lead to pin J5-H on hull networks box and connect black multimeter lead to ground.

NOTE C: If meter reads between 18 and 30 VDC, have 63E replace cable 2W112.

NOTE D: If meter does not read between 18 and 30 VDC, have 63E replace hull networks box.
17. Verify trouble solved by operating auxiliary hydraulic system.
18. Watch hydraulic pressure gage as pressure falls.
19. Set multimeter to measure continuity.
20. Connect red multimeter lead to pin J1-B on auxiliary hydraulic pressure switch and connect black multimeter lead to pin J1-C on auxiliary hydraulic pressure switch.

NOTE E: If meter reads near 0 ohms, go to step 22. If not, do step 21.
21. Replace auxiliary hydraulic pressure switch.
22. Set VEHICLE MASTER POWER switch to ON.
23. Reconnect cable 2W112-P3 to auxiliary hydraulic pressure switch.
24. Disconnect cable 2W112-P2 from J1 on auxiliary hydraulic pump.
25. Set multimeter to measure 50 VDC.
26. Connect red multimeter lead to pin P2-G on cable 2W112 and connect black multimeter lead to ground.
27. Set TURRET POWER switch to ON.
28. Connect red multimeter lead to pin P2-G on cable 2W112 and connect black multimeter lead to ground.
29. Set AUX HYDR POWER switch to ON.

NOTE F: If meter reads between 18 and 30 VDC, go to step 35. If not, go to step 30.
30. Manually traverse turret to access hull networks box from turret.
31. Disconnect cable 2W112-P1 from J5 on hull networks box.

TASK 2.7.12.3 TROUBLESHOOT AUXILIARY HYDRAULIC PUMP FAULT SYMPTOM (cont'd.)

32. Set multimeter to measure 50 VDC.
33. Connect red multimeter lead to pin J5-M on hull networks box and connect black multimeter lead to ground.
NOTE G: See Note C.
NOTE H: See Note D.
34. Verify trouble solved by operating auxiliary hydraulic system.
35. Connect red multimeter lead to pin J1-H on auxiliary hydraulic pump and connect black multimeter lead to ground.
NOTE I: If meter reads between 28 and 30 VDC, go to step 38. If not, go to step 36.
36. Replace auxiliary hydraulic pump.
37. Verify trouble solved by operating auxiliary hydraulic system.
38. Reconnect cable 2W112-P2 to auxiliary hydraulic pump.
39. Manually traverse turret to access hull networks box from turret.
40. Disconnect cable 2W112-P1 from J5 on hull networks box.
41. Set multimeter to measure 50 VDC.
42. Connect red multimeter lead to pin P1-N on cable 2W112 and connect black multimeter lead to ground.
NOTE J: If meter does not read between 18 and 30 VDC, have 63E replace cable 2W112.
43. Verify trouble solved by operating auxiliary hydraulic system.
NOTE K: If meter reads between 18 and 30 VDC, reconnect cable 2W112-P1 to J5 on hull networks box.
44. Disconnect cable 2W109-P3 from J7 on hull networks box.
45. Set multimeter to measure 50 VDC.
46. Connect red multimeter lead to pin J7-T on hull networks box and connect black multimeter lead to ground.
NOTE L: See Note D.
47. Verify trouble solved by operating auxiliary hydraulic system.
NOTE M: If meter reads between 18 and 30 VDC, do step 48.

TASK 2.7.12.3 TROUBLESHOOT AUXILIARY HYDRAULIC PUMP FAULT SYMPTOM (cont'd.)

48. Set TURRET POWER switch to OFF.
49. Reconnect cable 2W109-P3 to J7 on hull networks box.
50. Manually traverse turret until auxiliary hydraulic pump is visible through turret platform access door.
51. Disconnect cable 2W112-P2 from J1 on auxiliary hydraulic pump.
52. Set multimeter to check continuity between pins of auxiliary hydraulic pump as follows:

Pin	to	Pin
J1-A		J1-G
J1-C		J1-D
J1-F		J1-B

NOTE N: If continuity is within tolerance, go to step 55.

NOTE O: If continuity is not within tolerance, go to step 53.

53. Replace auxiliary hydraulic pump.
54. Verify trouble solved by operating auxiliary hydraulic system.
55. Reconnect cable 2W112-P2 to auxiliary hydraulic pump.
56. Manually traverse turret to access hull networks box from turret.
57. Disconnect cable 2W112-P1 from J5 on hull networks box.
58. Use multimeter to check continuity between pins on cable 2W112 as follows:

Pin	to	Pin
P1-A		P1-G
P1-C		P1-D
P1-F		P1-B

TASK 2.7.12.3 TROUBLESHOOT AUXILIARY HYDRAULIC PUMP FAULT SYMPTOM (cont'd.)

NOTE P: If continuity is within tolerance, go to step 61.

NOTE Q: If continuity is not within tolerance, go to step 59.

59. Replace cable 2W112.

60. Verify trouble solved by operating auxiliary hydraulic system.

61. Set TURRET POWER switch to ON.

62. Set AUX HYDR POWER switch to ON.

63. Set multimeter to measure 50 VDC.

64. Connect black multimeter lead to ground and connect red multimeter lead to pin J5-G on hull networks box.

65. Move red lead to pin J5-D, then to pin J5-B.

NOTE R: If meter reads between 18 and 30 VDC for each test, go to step 68.

Does meter read between 18 and 30 VDC for each test?

NOTE S: If meter does not read between 18 and 30 VDC for each test, go to step 66.

66. Replace hull networks box.

67. Verify trouble solved by operating auxiliary hydraulic system.

68. Reconnect cable 2W112-P1 to J5 on hull networks box.

69. Remove slipring cover.

70. Disconnect cable 1W101-P1 from J8 on hull/turret slipring.

71. Connect red multimeter lead to pin J8-K on slipring and connect black multimeter lead to ground.

NOTE T: If meter reads between 18 and 30 VDC, the problem is in cable 2W109 or slipring assembly. Notify direct support maintenance.

NOTE U: If meter reads between 18 and 30 VDC, go to step 72.

72. Set VEHICLE MASTER POWER switch to OFF.

73. Remove connector guard from turret networks box.

74. Disconnect cable 1W101-P2 from J11 on turret networks box.

75. Use multimeter to check continuity between pins P1-k and P2-b on cable 1W101.

TASK 2.7.12.3 TROUBLESHOOT AUXILIARY HYDRAULIC PUMP FAULT SYMPTOM (cont'd.)

NOTE V: If continuity is within tolerance, go to step 78.

NOTE W: If continuity is not within tolerance, go to step 76.

76. Replace cable 1W101.
77. Verify trouble solved by operating auxiliary hydraulic system.
78. Disconnect cable 1W102-P1 from J8 on turret networks box.
79. Use multimeter to check continuity between pins on cable 1W102 listed below (set AUX HYDR POWER switch to indicated position before making each check):

Cable 1W102

AUX HYDR POWER

Pin	to	Pin	Switch Position	Meter Reading
P1-Z		P1-a	Centered	Infinity
P1-Y		P1-a	Centered	Infinity
P1-Z		P1-a	Held Off	Zero
P1-Y		P1-a	Held Off	Infinity
P1-Z		P1-a	Held Off	Infinity
P1-Y		P1-a	Held Off	Infinity
P1-Z		P1-y	Centered	Infinity
P1-Z		P1-y	Held Off	Infinity
P1-Z		P1-y	Held Off	Zero

NOTE X: If continuity is correct, have 63E replace hull networks box and do step 81.

NOTE Y: If continuity is incorrect, go to step 80.

80. Replace commander's control panel.
81. Verify trouble solved by operating auxiliary hydraulic system.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-235 to 3-240.

TIME:

2 Hours, 30 Minutes

**XMI 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Filter Manifold Assembly (2.7.13)

PERFORMANCE OUTCOMES:

Mechanic will:

2.7.13.1 Replace hydraulic filter manifold and fittings (48 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

- Task 2.7.13.1**
- a. Packing and elbow attached to filter manifold.
 - b. Hose attached to elbow at rear of filter manifold.
 - c. Filter manifold attached to reservoir cover.
 - d. Packings and connectors attached to left and right sides of filter manifold.
 - e. Hose attached to elbow at rear of filter manifold attached also to second hose.
 - f. One tube and two hoses attached to left and right sides of filter manifold.
 - g. Shield in place and secure.

TASK 2.7.13.1 REPLACE HYDRAULIC FILTER MANIFOLD AND FITTINGS

PARTS:	Manifold, filter (XM 65099)
TOOLS:	Socket, socket wrench, 1/2 inch square Socket, socket wrench, 1/2 inch square drive, 7/16 inch Extension, socket wrench, 1/2 inch square drive, 6 inch Handle, socket wrench, ratchet, 1/2 inch square drive Wrench, open end, 2 inch
EXPENDABLES:	Caps, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURES:

1. Position main gun over right front fender.
2. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. Unscrew but do not remove four screws from shield using 7/16 inch socket, extension, and handle.
2. Remove shield.
3. Unscrew and remove one tube and two hoses from connectors on left and right sides of filter manifold using 2-inch wrench.
4. Cap lines.
5. Unscrew and remove three connectors from left and right sides of filter manifold using 2-inch wrench.
6. Remove and discard packings.
7. Cap filter manifold.
8. Unscrew and remove hose leading from elbow at rear of filter manifold to other hose.
9. Cap hose and connector.
10. Unscrew and remove four screws using 3/4 inch socket and handle.

CAUTION: Do not nick or burr machine finishes of filter manifold or hydraulic reservoir cover.

11. Carefully lift out filter manifold and move to suitable work area.

TASK 2.7.13.1 REPLACE HYDRAULIC FILTER MANIFOLD AND FITTINGS (Cont'd.)

12. Unscrew and remove hose from elbow at rear of filter manifold using 2-inch wrench.
13. Cap hose.
14. Unscrew and remove elbow from rear of filter manifold using 2-inch wrench.
15. Remove and discard packing.
16. Cap filter manifold.
17. Turn in defective filter manifold.
18. Inspect fittings for cracks or dents.
19. If damaged, replace part.
20. Uncap rear of filter manifold.
21. Screw in and tighten new packing and elbow to filter manifold.
22. Uncap hose.
23. Screw in and tighten hose to elbow using 2-inch wrench.

<p>CAUTION: Do not nick or burr machine finishes of filter manifold or hydraulic reservoir cover.</p>
--

24. Carefully lift filter manifold in position onto reservoir cover.
25. Screw in and tighten four screws using 3/4 inch socket and handle.
26. Uncap filter manifold.
27. Screw in and tighten three new packings and connectors on left and right sides of filter manifold using 2-inch wrench.
28. Uncap hose leading from elbow at rear of filter manifold.
29. Screw in and tighten hose to other hose.
30. Uncap tube and two hoses.
31. Screw in and tighten one tube and two hoses to right and left sides of filter manifold using 2-inch wrench.
32. Put shield in place and secure with four screws using 7/16 inch socket, extension, and handle.

TASK 2.7.13.1 REPLACE HYDRAULIC FILTER MANIFOLD AND FITTINGS (Cont'd.)

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Operate gunner's power control handles with main pump and auxiliary pump checking for leaks.

REFERENCES:

DEP 9-2350-255-20-1-3-2; pp. 8-9 to 8-19.

TIME:

48 Minutes

**XMI 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Relief Valve and Tube Assembly (2.7.14)

PERFORMANCE OUTCOMES:

Mechanic will:

2.7.14.1 Replace hydraulic relief valve and tube assembly. (24 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- | |
|---|
| <p>Task 2.7.14.1</p> <ul style="list-style-type: none">a. Tube attached to wall fitting.b. Hose attached to slipring elbow.c. Tube attached to tee.d. New packing on elbow.e. Elbow attached to hydraulic relief valve.f. New packing on connectors.g. Connectors attached to hydraulic relief valve.h. Hydraulic relief valve secured.i. Hose and tubes attached to hydraulic relief valve. |
|---|

TASK 2.7.14.1 REPLACE HYDRAULIC RELIEF VALVE AND TUBE ASSEMBLY

PARTS:	Valve, relief (XM22631)
TOOLS:	Socket, socket wrench, deep style, 3/8 inch square drive, 7/16 inch Extension, socket wrench, 3/8 inch square drive, 6 inch Extension, socket wrench, 1/2 inch square drive, 20 inch Handle, socket wrench, ratchet, 3/8 inch square drive Handle, socket wrench, ratchet, 1/2 inch square drive Wrench, open end, 1 1/2 inch (two required) Tool kit, crowfoot wrenches, XM-J388
EXPENDABLES:	Caps, protective, MIL-C-5501 (assorted sizes) Packings, preformed (three required)

PRELIMINARY PROCEDURES:

1. Position main gun over right front fender.
2. Lock turret.
3. Reduce system hydraulic pressure to zero.
4. Remove slipring cover.

MECHANIC WILL:

NOTE A: Cap all lines and fittings as they are taken care of.

1. Open turret platform access door.
2. Traverse turret until relief valve is seen through door.
3. Unscrew and remove hose and two tubes from valve using open end wrench.
4. Unscrew and remove two screws from top of valve using socket, extension, and handle.
5. Unscrew and remove two connectors and packings from valve using wrench.
6. Discard packings.
7. Unscrew and remove elbow and packing from valve using wrench.
8. Discard packing.
9. Turn in defective relief valve.
10. Unscrew and remove tube from wall fitting using 1 1/2 inch crowfoot, extension, and handle.

TASK 2.7.14.1 REPLACE HYDRAULIC RELIEF VALVE AND TUBE ASSEMBLY (Cont'd.)

11. Unscrew and remove other tube from tee using two open end wrenches.
12. Inspect tubes for holes or cracks.
13. If damaged, replace part.
14. Unscrew and remove hose from slipring elbow using 1 1/2 inch crowfoot wrench, extension, and handle.
15. Inspect hose.
16. Replace if threads are stripped.
NOTE B: Uncap all lines and fittings before installing hose.
17. Screw in and tighten tube to wall fitting using 1 1/2 inch crowfoot wrench, extension, and handle.
18. Screw in and tighten hose to slipring elbow using 1 1/2 inch crowfoot wrench, extension, and handle.
19. Screw in and tighten tube to tee using two open end wrenches.
20. Put new packing on elbow.
21. Screw in and tighten elbow to valve using open end wrench.
22. Put two new packings on two connectors,
23. Screw connectors into valve using open end wrench.
24. Put valve in place.
25. Secure with two screws using socket, extension, and handle.
26. Screw on and tighten hose and two tubes to valve using open end wrenches.
27. Close turret platform access door.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Install slipring cover.
3. Operate gunner's power control handles with main and auxiliary pumps.

REFERENCES:

DEP 9-2350-255-20-1-3-3; pp. 8-53 to 8-59.

TIME:

24 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Main Accumulator (2.7.15)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.7.15.1 Replace main accumulator. (24 minutes)
- *2.7.15.2 Service main accumulator. (48 minutes)
- *2.7.15.4 Replace main accumulator charging valve. (12 minutes)

MEASUREMENT:

(for each task)

- During Training:**
- Time - Between end of initiating stimuli and completion of task.
 - Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
- End of Training:**
- Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 - Accuracy - As indicated by:

- | | |
|----------------------|--|
| Task 2.7.15.1 | <ul style="list-style-type: none">a. New packing on main accumulator fitting.b. Main accumulator fitting attached to main accumulator.c. Clamp nuts holding main accumulator in place torqued between 8 and 10 foot-pounds (11 to 14 newton meters).d. Hose attached to bottom of main accumulator. |
|----------------------|--|

- | | |
|----------------------|--|
| Task 2.7.15.2 | <ul style="list-style-type: none">a. Between 750 and 775 pounds of pressure (nitrogen) registers in main accumulator.b. Nitrogen gas not leaking. |
|----------------------|--|

XM1 45E TURRET MECHANIC (Cont'd.)

- Task 2.7.15.4**
- a. New charging valve attached to main accumulator.**
 - b. Valve cap and cover attached to main accumulator.**

***TASK 2.7.15.1 REPLACE MAIN ACCUMULATOR**

PARTS:	Accumulator assembly (XM61560)
TOOLS:	Wrench, open end, 1 1/2 inch (two required) Wrench, open end, 3/8 inch (two required) Wrench, torque, 0 to 175 foot-pounds
EXPENDABLES:	Rags, wiping Caps and plugs, protective, MIL-C-5501 (assorted sizes) Packing, preformed

PRELIMINARY PROCEDURES:

1. Traverse turret to position main gun over right front fender.
2. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. Unscrew and remove hose from bottom of accumulator using two 1 1/2 wrenches.
2. Cap hose.
3. Loosen two clamp nuts on two clamps using 3/8 inch wrench.
4. Lift accumulator out of vehicle and set on flat, dry work surface.
5. Unscrew and remove fitting and packing using 1 1/2 inch wrench.
6. Discard packing and cap fitting.
7. Turn in defective accumulator.
8. Uncap fitting and put new packing on fitting.
9. Screw in and tighten fitting using 1 1/2 inch wrench.
10. Put accumulator in place in vehicle.
11. Tighten two clamp nuts on two clamps using 3/8 inch wrench.
12. Torque two nuts between 8 and 10 foot-pounds (11 to 14 newton meters) using torque wrench.
13. Uncap hose and screw on and tighten hose using two 1 1/2 inch wrenches.

***TASK 2.7.15.1 REPLACE MAIN ACCUMULATOR (Cont'd.)**

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed hydraulic system.
3. Operate gunner's power control handles.
4. Traverse turret as needed.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-127 to 2-129.

TIME:

24 Minutes

***TASK 2.7.15.2 SERVICE MAIN ACCUMULATOR**

PARTS:	None
TOOLS:	Wrench, open end, 1 1/8 inch Wrench, open end, 1 1/2 inch Wrench, open end, 7/16 inch Wrench, torch and regulator Wrench, combination, 3/8 inch Wrench, combination, 3/4 inch Kit, purging, Sk-J-201 Nitrogen, gray with two black rings
EXPENDABLES:	Compound, leak detector Rags, wiping

PRELIMINARY PROCEDURE:

1. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. Manually traverse turret so that main gun is over right front fender of tank.
2. Position nitrogen tank and charging device next to tank.
3. Open nitrogen tank valve for one or two seconds, then close valve tight by hand.
4. Screw on and tighten charging device to nitrogen tank using 1 1/8 inch wrench. (Use adapter if needed.)
5. Turn T-valve full left.
6. Unscrew tank valve to left.

NOTE A: Gage should show 1000 to 2000 pounds of pressure. If it does not, close tank valve, unscrew charging device, and get new tank of nitrogen. Go back to step 4.

7. Tighten tank valve to right by hand.
8. Close manifold shutoff valve and bleeder valve.
9. Turn handle to open chuck valve. (Hand charging device to assistant.)
10. Unscrew and remove cover from main accumulator using 1 1/2 inch wrench.
11. Unscrew and remove cap using 3/8 inch wrench.
12. Screw on charging device chuck valve to accumulator, charging valve two to three turns by hand.

***TASK 2.7.15.2 SERVICE MAIN ACCUMULATOR (Cont'd.)**

13. Unscrew and lift off manifold pressure gage. (Set gage in safe place.)
14. Direct assistant to open nitrogen tank valve and turn T-bar to right until 15 to 20 pounds of pressure shows on gage.
NOTE B: Assistant should turn T-bar about one turn to left after pressure reaches 15 to 20 pounds and tell mechanic that line is charged.
15. Open manifold shut-off valve.
16. Listen for gas coming from check valve.
17. When gas is heard, tighten valve using 7/16 inch wrench.
18. Direct assistant to open nitrogen tank valve and turn T-handle to right until gage shows 750 to 775 pounds of pressure.
19. Unscrew thin nut two turns using 3/4 inch wrench.
20. Screw in valve until gas just starts to flow into accumulator.
NOTE C: Make sure gas flows into accumulator slowly and pressure gage is kept between 750 and 775 pounds of pressure.
21. When gas can no longer be heard going into accumulator, direct assistant to screw in and tighten nitrogen tank valve.
NOTE D: Assistant should watch pressure gage. If pressure drops below 750 pounds, tell mechanic to check for gas leaks. To check for leaks, go to step 22. If pressure does not drop, go on to step 27.
22. Listen for gas leaking from charging device and charging valve.
23. Spread on compound if gas cannot be heard.
24. Tighten loose parts if leak is found, or replace charging valve.
25. If gas leak cannot be found and pressure still drops, replace accumulator.
26. If pressure stops dropping, repeat steps 18-21.
27. Tighten thin nut using 3/4 inch wrench.
28. Unscrew nitrogen tank valve and bleeder valve. Tell assistant to tell you when pressure gage drops to zero pounds.

***TASK 2.7.15.2 SERVICE MAIN ACCUMULATOR (Cont'd.)**

29. Unscrew and remove nitrogen tank valve fitting using 7/16 inch wrench.
30. Tell assistant to turn in all nitrogen charging tools and supplies.
31. Screw on and tighten cap using 3/8 inch wrench.
32. Screw on and tighten cover using 1 1/2 inch wrench.

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Operate gunner's power control handles.

REFERENCES:

DEP 9-235--255-20-2-3-2; pp. 2-107 to 2-116.

TIME:

48 Minutes

***TASK 2.7.15.4 REPLACE MAIN ACCUMULATOR CHARGING VALVE**

PARTS:	Valve, air (MS38889-2)
TOOLS:	Wrench, open end, 3/8 inch Wrench, open end, 3/4 inch Wrench, open end, 1 1/2 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Position main gun over right front fender.
2. Engage turret lock.
3. Reduce system hydraulic pressure to zero.

MECHANIC WILL:

1. From driver's compartment, unscrew and remove cover from top of main accumulator using 1 1/2 inch wrench.
2. Unscrew and remove cap using 3/8 inch wrench.
3. Using 3/4 inch wrench, turn valve to relieve gas pressure.
4. Unscrew and remove charging valve using 3/4 inch wrench.
5. Turn in charging valve.
6. Screw in and tighten charging valve using 3/4 inch wrench.
7. Screw on and tighten valve cap using 3/8 inch wrench.
8. Screw on and tighten cover using 1 1/2 inch wrench.

FOLLOW ON PROCEDURES:

1. Service accumulator precharge pressure.
2. Operate gunner's power control handles.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-130 to 2-132.

12 Minutes

**XMI 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Hydraulic System (2.7)

COMPONENT:

Hydraulic Power Distribution Valve (2.7.17)

PERFORMANCE OUTCOMES:

Mechanic will:

***2.7.17.1 Replace hydraulic power distribution valve (42 minutes)**

MEASUREMENT:

(for each task)

During Training: **Time - Between end of initiating stimuli and completion of task.**
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: **Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.**
Accuracy - As indicated by:

- | | |
|----------------------|---|
| Task 2.7.17.1 | <ul style="list-style-type: none">a. New packing put onto 11 power distribution valve fittings.b. Adapters (nine) attached to power distribution valve.c. Reducers (two) attached to power distribution valve.d. Lines (two) attached at rear of power distribution valve.e. Screws holding power distribution valve in place torqued between 30 and 36 foot-pounds (41 to 49 newton meters).f. Lines (nine) attached to power distribution valve.g. Electrical plugs attached to power distribution valve. |
|----------------------|---|

***TASK 2.7.17.1 REPLACE HYDRAULIC POWER DISTRIBUTION VALVE**

PARTS:	Valve, hydraulic power distribution (XM61096) Packing preformed: (M83248-1-904) 2 ea. (M83248-1-908) 2 ea. (M83248-1-916) 2 ea.
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 9/16 inch Extension, socket wrench, 3/8 inch square drive - 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, adjustable, 10 inch Oiler, hand Wrench, open end, 11/16 inch (two required) Wrench, open end, 9/16 inch (two required) Wrench, open end, 1 1/2 inch Wrench, open end, 1 5/8 inch Wrench, torque, 0 to 175 foot-pounds
EXPENDABLES:	Rags, wiping Oil, lubricating, OE/HDO-30, MIL-L-2104 Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURES:

1. Reduce system hydraulic pressure to zero.
2. Traverse main gun over right front fender.
3. Put driver's seat in closed hatch position.

CAUTION: Oil could drain from reservoir and dirt could enter hydraulic system and cause damage if lines are not capped.

MECHANIC WILL:

1. Put driver's seat in full reclined position.
2. Put rags around valve to soak up leaking fluid.
3. Unscrew and remove four electrical plugs and cap plugs.
4. Unscrew and remove two lines using two 9/16 inch wrenches and cap lines.
5. Unscrew and remove seven lines using 1 1/2 inch and 1 5/8 inch wrenches and cap lines.
6. Unscrew and remove two lines using two 11/16 inch wrenches and cap lines.

*TASK 2.7.17.1 REPLACE HYDRAULIC POWER DISTRIBUTION VALVE (Cont'd.)

7. Unscrew and remove three screws and washers using socket, extension, and handle.
8. Take valve out of tank.
NOTE A: If old distribution valve is to be used again, replace packings on fittings.
9. Set old valve and new valve side by side on work area.
10. Unscrew and remove seven adapters and packings from old valve using 1 1/2 inch and 1 5/8 inch wrenches.
11. Discard packings.
12. Unscrew and remove two reducers and packings from old valve using adjustable wrench.
13. Discard packings.
14. Unscrew and remove two adapters and packings from old valve using 9/16 inch wrench.
15. Discard packings.
16. Remove shipping plugs from new valve and put them into old valve.
17. Turn in defective valve.
NOTE B: Take caps off all lines and fittings before installation.
18. Clean 11 fittings with rag and put new packing onto fittings.
19. Screw in and tighten seven adapters using 1 1/2 inch and 1 5/8 inch wrenches.
20. Screw in and tighten two reducers using adjustable wrench.
21. Screw in and tighten two adapters using 9/16 inch wrench.
22. Screw on and tighten two lines at rear of valve using 1 1/2 inch and 1 5/8 inch wrenches.
23. Spread oil on three screws using hand oiler.
24. Hold valve in place and secure with three screws and washers using socket, extension, and handle.
25. Torque three screws between 30 and 36 foot-pounds (41 to 49 newton meters) using torque wrench.
26. Screw on and tighten five lines using 1 1/2 inch wrenches and 1 5/8 inch wrench.
27. Screw on and tighten two lines using two 11/16 inch wrenches.
28. Screw on and tighten two lines using two 9/16 inch wrenches.
29. Screw on and tighten four electrical plugs by hand.

***TASK 2.7.17.1 REPLACE HYDRAULIC POWER DISTRIBUTION VALVE (Cont'd.)**

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed hydraulic system.
3. Operate gunner's power control handles.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-120 to 2-126.

TIME:

42 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Hydraulic System (1.1.2)

COMPONENT:

Ammunition Door Hydraulic Actuator (2.7.18)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.7.18.1 Replace ammunition door hydraulic actuator. (1 hour)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

- | | |
|---------------|--|
| Task 2.7.18.1 | a. Cushions replaced or free from cuts or wear. |
| | b. New bearings installed in actuator. |
| | c. Lines and hoses attached to actuator. |
| | d. Actuator and mounting cap in place. |
| | e. Locking pin put through rod end and ammunition door bracket. |
| | f. Line fittings attached. |
| | g. Clamps (two) attached securing right and left lines that go in turret cavity. |

***TASK 2.7.18.1 REPLACE AMMUNITION DOOR HYDRAULIC ACTUATOR**

PARTS:	Actuator, hydraulic (X1465957) Washer, lock, 2 ea. (MS 35338-155) Washer, lock, 6ea. (MS35333-40) Bearing, sleeve, 2 ea. (MS17796-70)
TOOLS:	Socket, socket wrench, 3/8 inch drive, 7/16 inch Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Knife, putty Punch, aligning Screwdriver, flat tip, 8 inch Wrench, open end, 9/16 inch Wrench, open end, 11/16 inch Wrench, open end, 1/4 inch Wrench, open end, 5/8 inch Brush, adhesive
EXPENDABLES:	Rags, wiping Solvent, cleaning, P-D-680, type 11 Adhesive, general purpose, MMM-A-1617 Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURE:

1. Reduce system hydraulic pressure to zero.

CAUTION: Dirt could enter hydraulic system and cause damage if lines are not plugged.
--

REPAIR WILL:

1. Unscrew and remove two connectors using 11/16 inch and 5/8 inch wrenches.
2. Pull out quick release pin by hand.
3. Remove actuator and unscrew and remove six screws and lockwashers using socket, extension, and handle.
4. Discard lockwashers and actuator on workbench.
5. Unscrew and remove two screws, lockwashers, washers, and nuts from clamps using 1/4 inch wrench and screwdriver.
6. Discard lockwashers.
7. Unscrew and remove two elbows and two lines using 11/16 inch wrench.
8. Remove and discard two bearings.
9. Loosen nut on rod end using 9/16 inch wrench.

***TASK 2.7.18.1 REPLACE AMMUNITION DOOR HYDRAULIC ACTUATOR (Cont'd.)**

10. Unscrew and remove rod end using punch if necessary.
11. Turn in defective actuator.
12. Check cushion on cylinder bracket for cuts or wear.

NOTE A: If not damaged, go to step 18. If damaged, go to step 13.

<p>WARNING: Many adhesives and solvents burn easily. Do not use near open fire. Use in well-ventilated area.</p>

13. Scrape off old cushion using putty knife and solvent.
14. Wipe cylinder bracket dry with rag.
15. Spread adhesive on new cushion using brush.
16. Press new cushion on cylinder bracket.
17. Repeat steps 12 thru 16 for any other bad cushions.
18. Screw nut on rod end finger tight.
19. Slide on two new bearings.
20. Uncap lines and put on two elbows and lines using 11/16 inch wrench.
21. Put actuator on by starting left and into opening on left side.
22. Attach one clamp securing right line that goes in barrel cavity with one screw, washer, new lockwasher, and nut using screwdriver and 1/4 inch wrench.
23. Move actuator to right.
24. Put line in place and secure with two screws and new lockwashers using socket, extension, and handle.
25. Put mounting cap in place and secure with four screws and new lockwashers using socket, extension, and handle.
26. Screw rod end in or out until locking pin can be put through rod end and door bracket.
27. Put in locking pin and tighten lock nut using 9/16 inch wrench.
28. Screw in and tighten line fittings using 11/16 inch and 5/8 inch wrenches.
29. Attach other clamp securing line in place with one screw, washer, new lockwasher, and nut using screwdriver and 1/4 inch wrench.

***TASK 2.7.18.1 REPLACE AMMUNITION DOOR HYDRAULIC ACTUATOR (Cont'd.)**

FOLLOW ON PROCEDURES:

1. Fill hydraulic reservoir.
2. Bleed hydraulic system.
3. Operate ammunition doors.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 2-132 to 2-139.

TIME:

1 Hour

APPENDIX F
STE/XM1 TEST SET

LESSON PLAN OUTLINE

STE/XM1 TEST SET

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 4 tasks in the STE/XM1 Test Set module.

CONDITIONS: As described in TM 9-4910-572-14&P.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the students and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.

The procedures for each task are from DEP TM 9-4910-572-1469, Test Set, STE/XM1, January 1980. There is a possibility that the procedures have changed with design changes in the XM1 and the test set. The procedures should be updated for the XM1 and test set based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XM1 procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

¹Boldorick, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HRRPO). Final Report 78-1, 1978.

XMI 45E TURRET MECHANIC

MODULE:

STE/XMI Test Set

COMPONENT:

Operation, Installation, and Reference Data

PERFORMANCE OUTCOMES:

Mechanic will:

- #1. Set-Up STE/XMI Test Set.
- #2. Conduct Self-Test.
- #3. Conduct Adapter Test.
- #4. Shut-Down STE/XMI Test Set.

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

- | | |
|--------|--|
| Task 1 | a. Cables checked in accordance with Frame 1, page 4-6, TM 9-4910-572-14&P. |
| | b. Vehicle test meter checked in accordance with Frame 2, page 4-7, TM 9-4910-572-14&P. |
| | c. Controllable interface box checked in accordance with Frame 3, page 4-8, TM 9-4910-572-14&P. |
| | d. Set Communicator checked in accordance with Frame 4, page 4-9, TM 9-4910-572-14&P. |
| | e. Test cables, shorting plug, and NATO adapter check in accordance with Frame 5, page 4-10, TM 9-4910-572-14&P. |

XMI 45E TURRET MECHANIC (Cont'd.)

- f. Cables connected in accordance with Frame 6, page 4-11, TM 9-4910-572-14&P.
- g. Test set connected to power source in accordance with Frame 7, page 4-12, TM 9-4910-572-14&P.

Task 2 a. Self-test conducted in accordance with Frame 8 through Frame 23, pages 4-13 through 4-28 and Frame 24 through Frame 26, pages 4-29 through 4-31, TM 9-4910-572-14&P.

Task 3 a. Adapter test conducted in accordance with page 4-34, and Frame 1 through Frame 4, pages 4-35 through 4-38, TM 9-4910-572-14&P.

Task 4 a. STE/XMI test set shut-down in accordance with Frame 1 through Frame 2, pages 4-32 through 4-33, TM 9-4910-572-14&P.

#TASK 1 SET-UP STE/XM1 TEST SET

4-5. Set-Up Procedures For STE/XMI Test Set.

Preliminary Procedures:

1. Unlatch and takeoff the cover on the VTM/Transducer, Set Communicator assembly transit case. Take out the following items:
 - Vehicle Test Meter
 - Set Communicator
 - Signal Cable W1
 - NATO Adapter CA1

Put on and latch the cover on the transit case.

2. Unlatch and takeoff the cover on the Controllable Interface Assembly transit case. Take out the following item:
 - Controllable Interface Box

Put on and latch the cover on the transit case.

3. Unlatch and takeoff the cover on the Test Cables and Adapters transit case. Take out the following items:
 - Test Cable CX304
 - Test Cable CX305
 - Shorting Plug TA301
 - Power Cable CX306

Put on and latch the cover on the transit case.

4. Unlatch and takeoff the cover on the Transmission/Fire Extinguisher Accessories Transit case. Take out the following item:
 - Extender Cable CX603

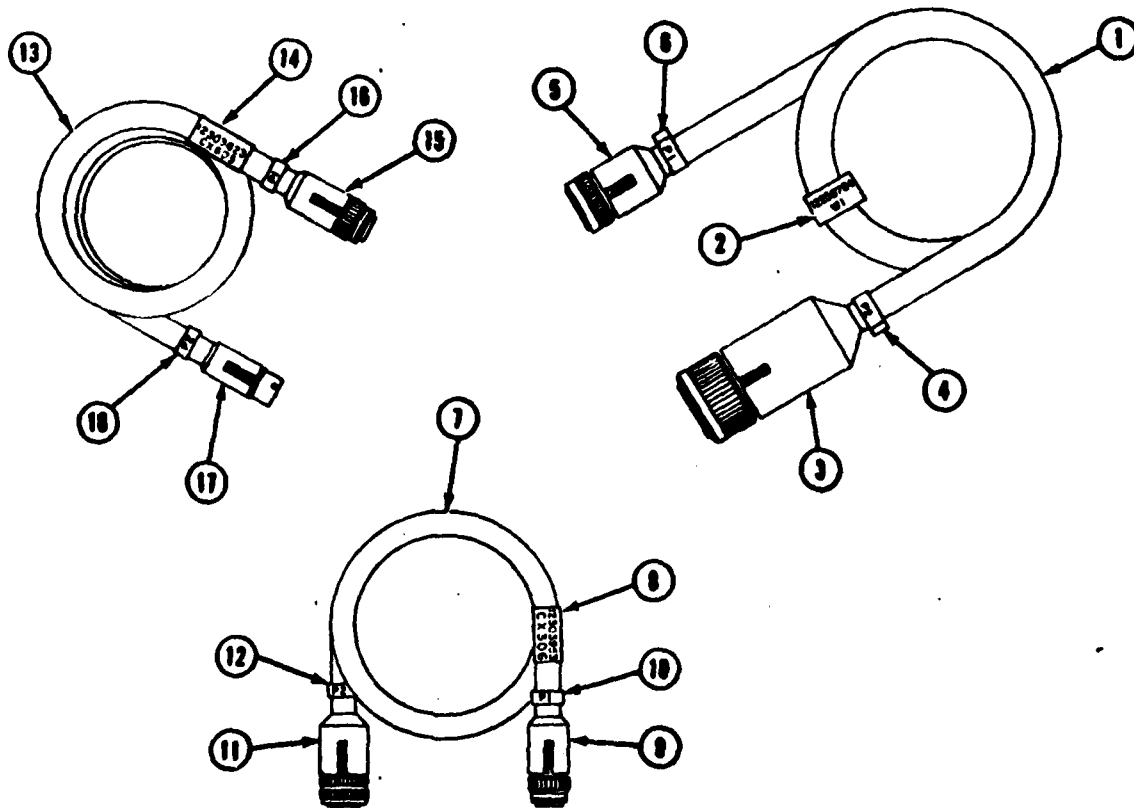
Put on and latch the cover on the transit case.

FRAME 1

Check Cables:

1. Make sure signal cable (1) has a band marker (2) stamped W1. Make sure connector (3) has a band marker (4) stamped P2. Make sure connector (5) has a band marker (6) stamped P1. If any band markers are missing, notify your supervisor.
2. Look at signal cable (1) for cuts or breaks in insulation. Clean connectors (3), (5) if dirty. Look at connectors (3), (5) for bent or missing pins, damaged threads and for pitting or rust. If bad, notify your supervisor.
3. Make sure power cable (7) has a band marker (8) stamped CX306. Make sure connector (9) has a band marker (10) stamped P1. Make sure connector (11) has a band marker (12) stamped P2. If any band markers are missing, notify your supervisor.
4. Look at power cable (7) for cuts or breaks in insulation. Clean connectors (9), (11) if dirty. Look at connectors (9), (11) for bent or missing pins, or damaged threads and for pitting or rust. If bad, notify your supervisor.
5. Make sure extender cable (13) has a band marker (14) stamped CX603. Make sure connector (15) has a band marker (16) stamped P1. Make sure connector (17) has a band marker (18) stamped P2. If any band markers are missing, notify your supervisor.
6. Look at extender cable (13) for cuts or breaks in insulation. Clean connectors (15), (17) if dirty. Look at connectors (15), (17) for bent or missing pins, or or damaged threads and for pitting or rust. If bad, notify your supervisor.

GO TO FRAME 2

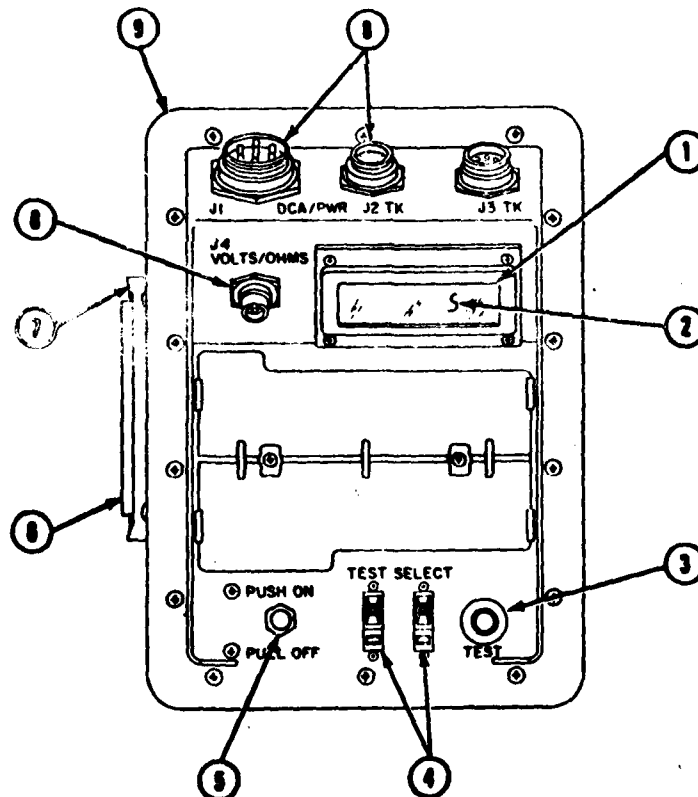


FRAME 2

Check Vehicle Test Meter:

1. Look at display (1) for dents and cracked or broken window (2). If display (1) is bad, notify your supervisor.
2. Look at TEST pushbutton switch (3). If switch (3) is loose or you do not hear a click when you press it, notify your supervisor.
3. Look at TEST SELECT switches (4). If switches (4) are loose or you cannot dial numbers on the switches (4), notify your supervisor.
4. Look at circuit breaker (5). If circuit breaker (5) is loose, or if you do not hear a click when you push it in or pull it out, notify your supervisor.
5. Look at handle (6). If mounting bracket (7) is loose or handle (6) does not spring back when you lift it, notify your supervisor.
6. Look at panel connectors (8) for bent or missing pins or damaged threads. If connectors (8) are bad, notify your supervisor.
7. Look at housing (9). If the housing (9) is dented or cracked in any place, notify your supervisor.

GO TO FRAME 3

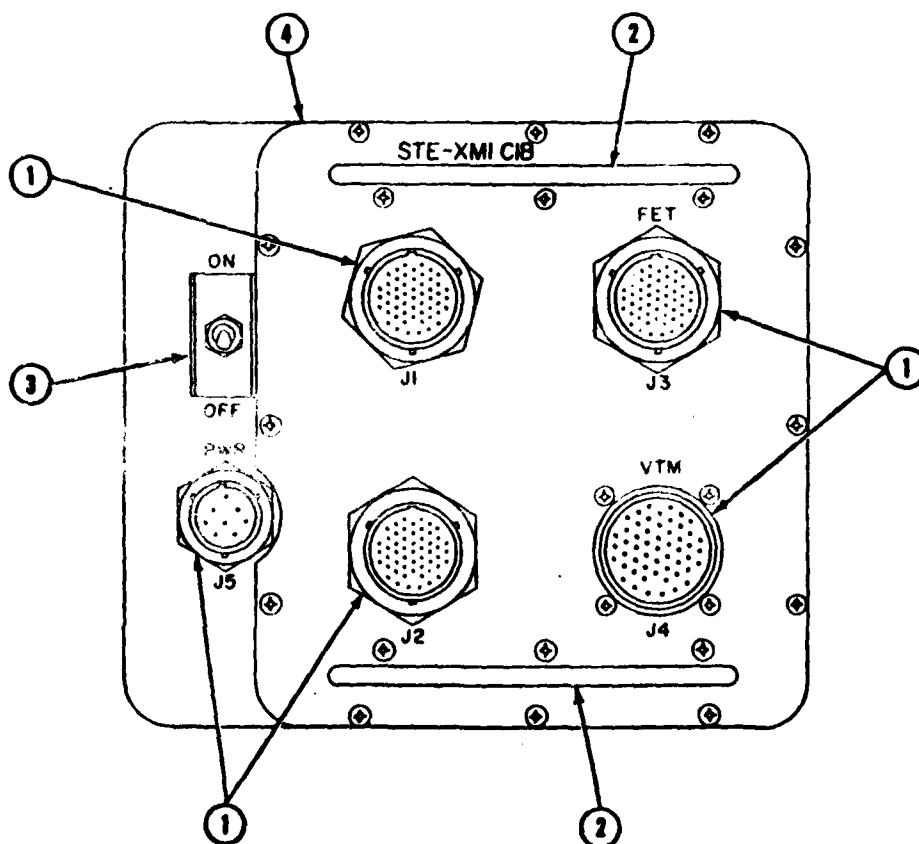


FRAME 3

Check Controllable Interface Box:

1. Look at panel connectors (1) for bent or missing pins or damaged threads. Look at panel connectors (1) for pitting or rust.
2. If panel connectors (1) are bad, notify your supervisor.
3. Look at handles (2). If handles (2) are loose, notify your supervisor.
4. Look at ON/OFF switch (3). If switch (3) is loose, or you do not hear a click when you set it to ON and set it to OFF, notify your supervisor.
5. Look at housing (4). If housing (4) has dents or cracks in any place, notify your supervisor.

GO TO FRAME 4

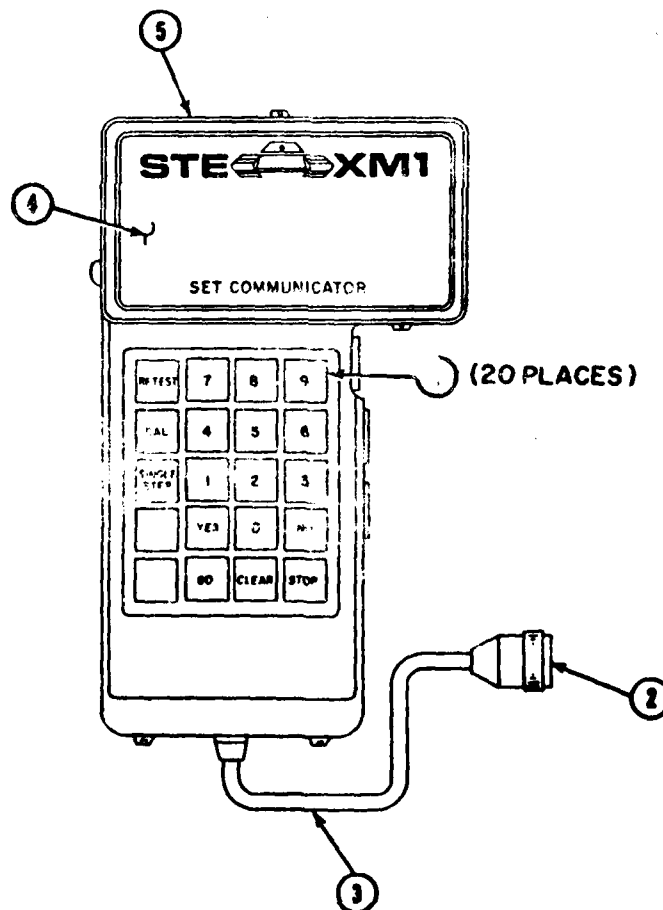


FRAME 4

Check Set Communicator:

1. Look at keys (1). If any keys (1) are chipped or cracked, notify your supervisor.
2. Look at connector (2) bent or missing pins, or damaged threads. Look at connector (2) for pitting or rust. If bad, notify your supervisor.
3. Look at cable (3). If cable (3) has cuts or broken insulation, notify your supervisor.
4. Look at display window (4). If display window (4) is broken or cracked, notify your supervisor.
5. Look at housing (5). If housing (5) is broken or cracked, notify your supervisor.

GO TO FRAME 5

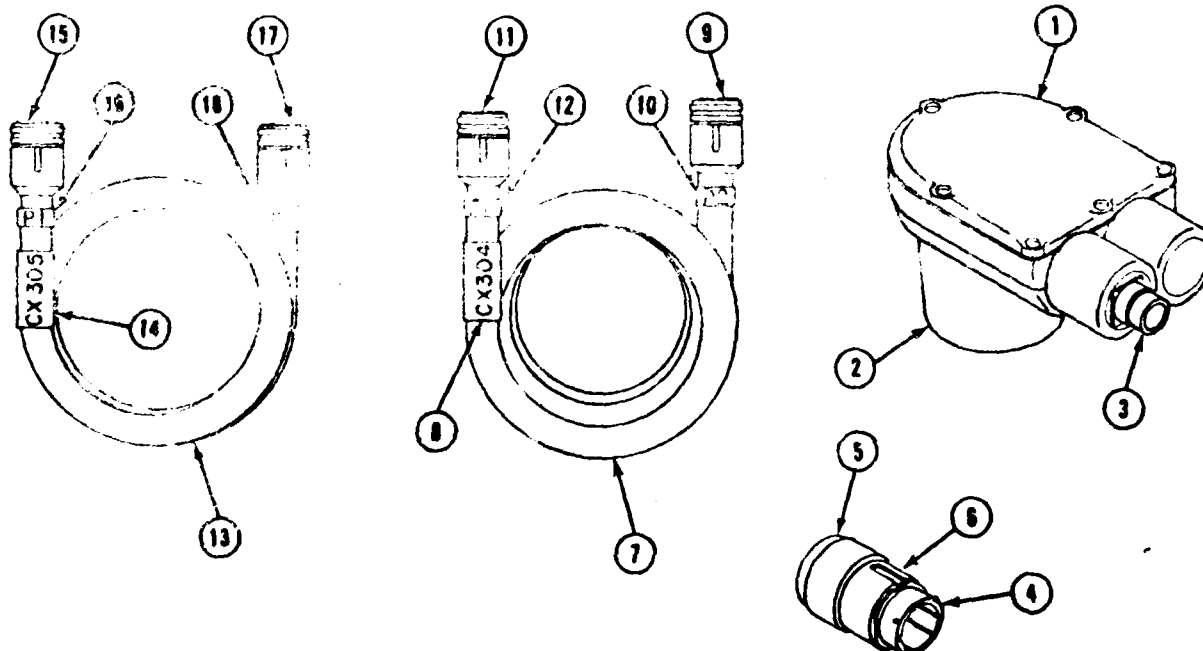


FRAME 5

Check Test Cables, Shorter Plug and NATO Adapter:

1. Look at NATO adapter CA1 (1) for breaks or cracks in housing (2). Clean connector (3) if dirty. Look at connector (3) for bent or missing pins. If bad, notify your supervisor.
2. Look at connectors (4), (5) of adapter TA301 (6) for dirt and bent or missing pins. Clean connectors (4), (5) if dirty. If bad, notify your supervisor.
3. Make sure signal cable (7) has a band marker (8) stamped CX304. Make sure connector (9) has a band marker (10) stamped P2. Make sure connector (11) has a band marker (12) stamped P1. If any band markers are missing, notify your supervisor.
4. Look at signal cable (7) for cuts or breaks in insulation. Clean connectors (9), (11) if dirty. Look at connectors (9), (11) for bent or missing pins and for pitting or rust. If bad, notify your supervisor.
5. Make sure signal cable (13) has a band marker (14) stamped CX305. Make sure connector (15) has a band marker (16) stamped P1. Make sure connector (17) has a band marker (18) stamped P2. If any band markers are missing, notify your supervisor.
6. Look at signal cable (13) for cuts or breaks in insulation. Clean connectors (15), (17) if dirty. Look at connectors (15), (17) for bent or missing pins and for pitting or rust. If bad, notify your supervisor.

GO TO FRAME 6

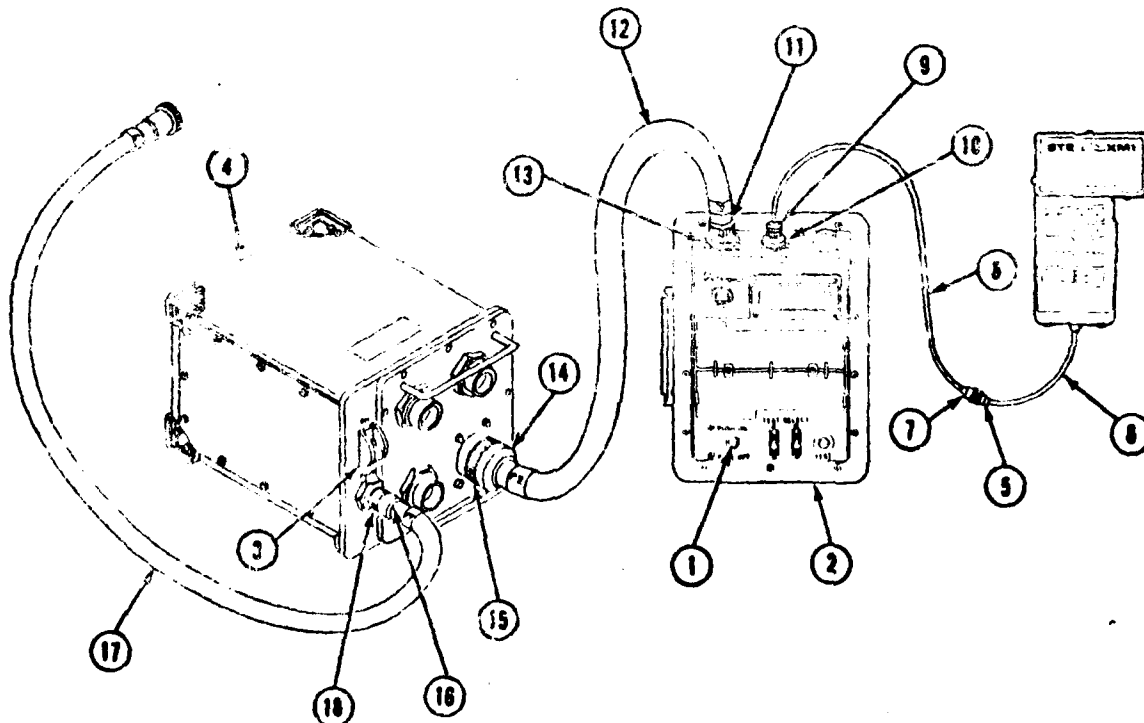


FRAME 6

Connect Cables:

1. Pull circuit breaker (1) on Vehicle Test Meter (2) to OFF.
2. Set ON/OFF switch (3) on Controllable Interface Box (4) to OFF.
3. Plug connector (5) of Set Communicator cable (6) into P2 connector (7) of CX603 extender cable (8).
4. Plug P1 connector (9) of CX603 extender cable (8) into J2 TK connector (10) on Vehicle Test Meter (2).
5. Plug P1 connector (11) of W1 cable (12) into J1 DCA/PWR connector (13) on Vehicle Test Meter (2).
6. Plug P2 connector (14) of W1 cable (12) into J4 VTM connector (15) on Controllable Interface Box (4).
7. Plug P2 connector (16) of CX306 cable (17) into J5 PWR connector (18) on Controllable Interface Box (4).

GO TO FRAME 7

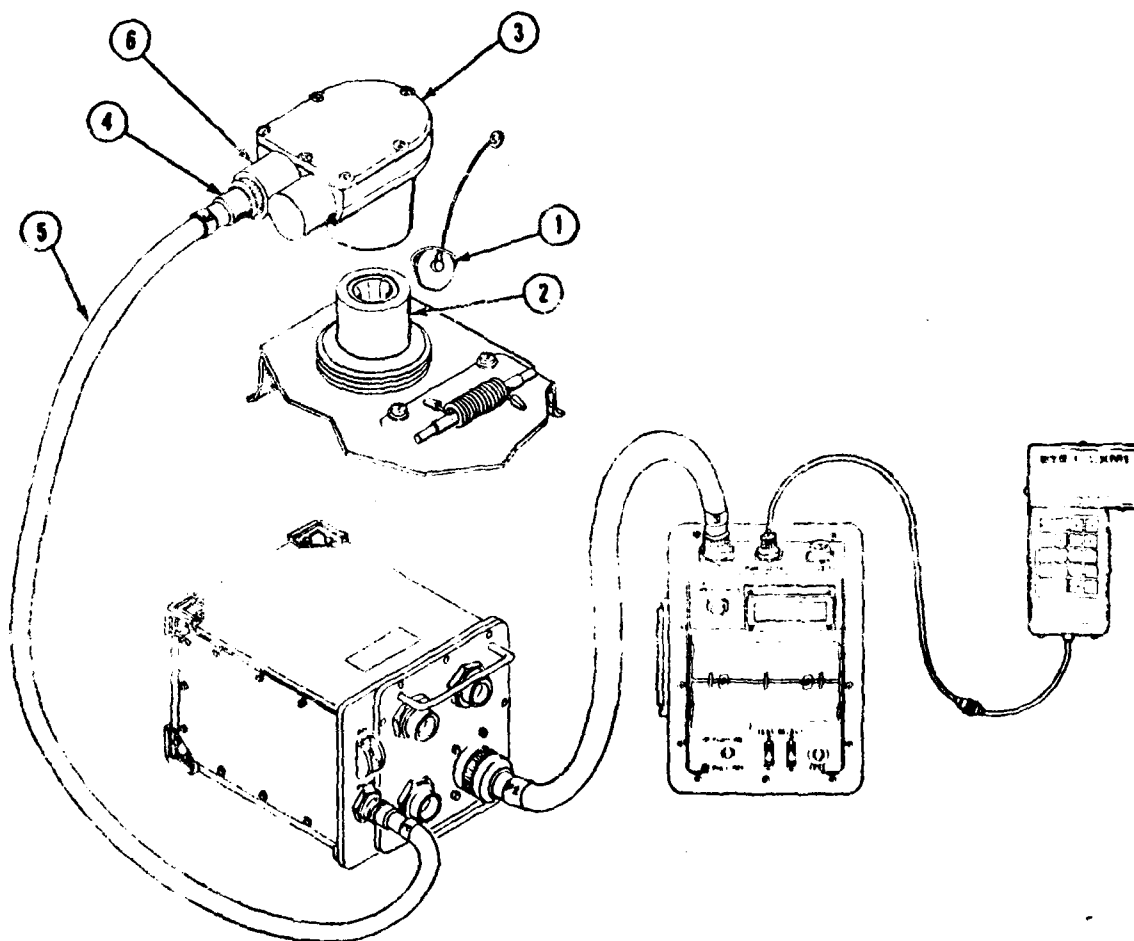


FRAME 7

Connect Test Set to Power Source:

1. Remove cap (1) from slave receptacle (2) in XM1 tank.
2. Plug NATO adapter (3) into slave receptacle (2).
3. Plug P1 connector (4) of CX306 cable (5) into J2 connector (6) of NATO adapter (3).

GO TO FRAME 8



TASK 2 CONDUCT SELF TEST

FRAME 8

Turn Power On, Start Self Test:

1. Set ON/OFF switch (1) on Controllable Interface Box (2) to ON.
2. Push circuit breaker (3) on Vehicle Test Meter (4) to ON.
3. Check that display (5) on Vehicle Test Meter (4) reads .8.8.8.8 then changes to ----.

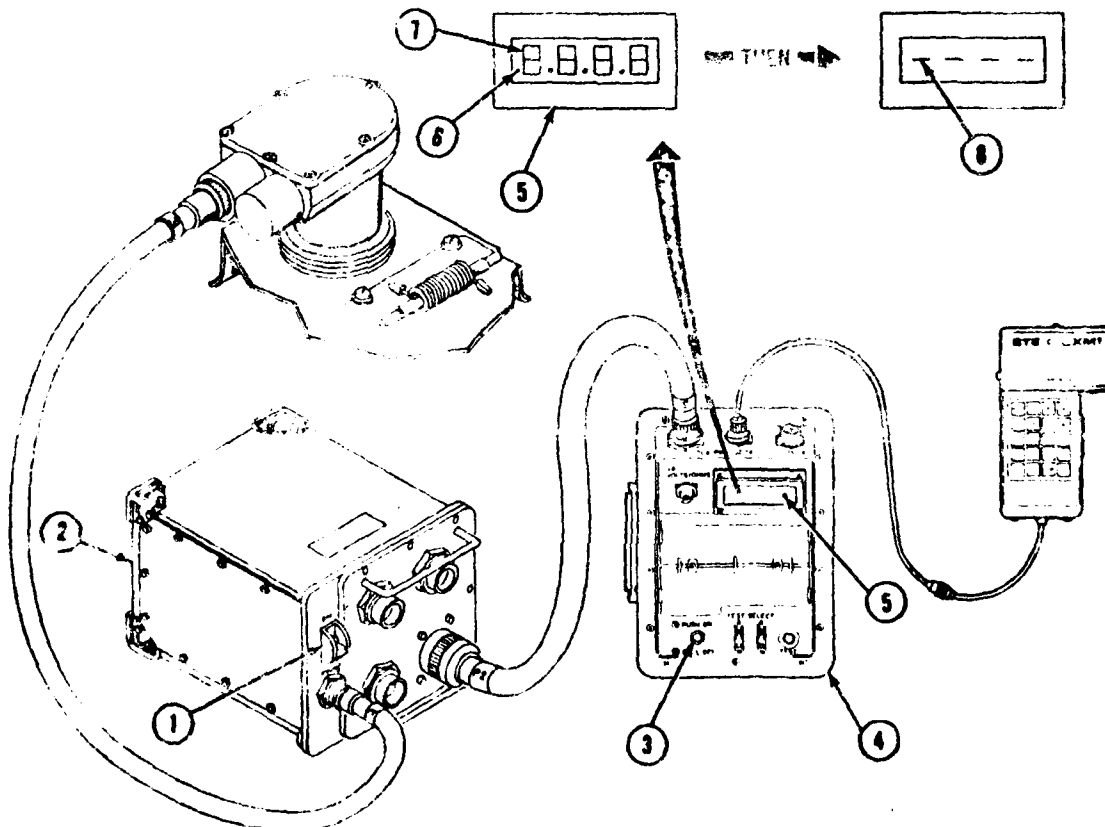
NOTE

If nothing appears on display (5), notify your supervisor.

NOTE

If any one dot (6), number eight (7), and dash (8) do not appear on display (5), perform shutdown procedure in paragraph 4-6. Replace display module with missing dot (6), number eight (7) and dash (8). Refer to volume IV, chapter 2, paragraph 2-4, task 1.

GO TO FRAME 9



FRAME 9

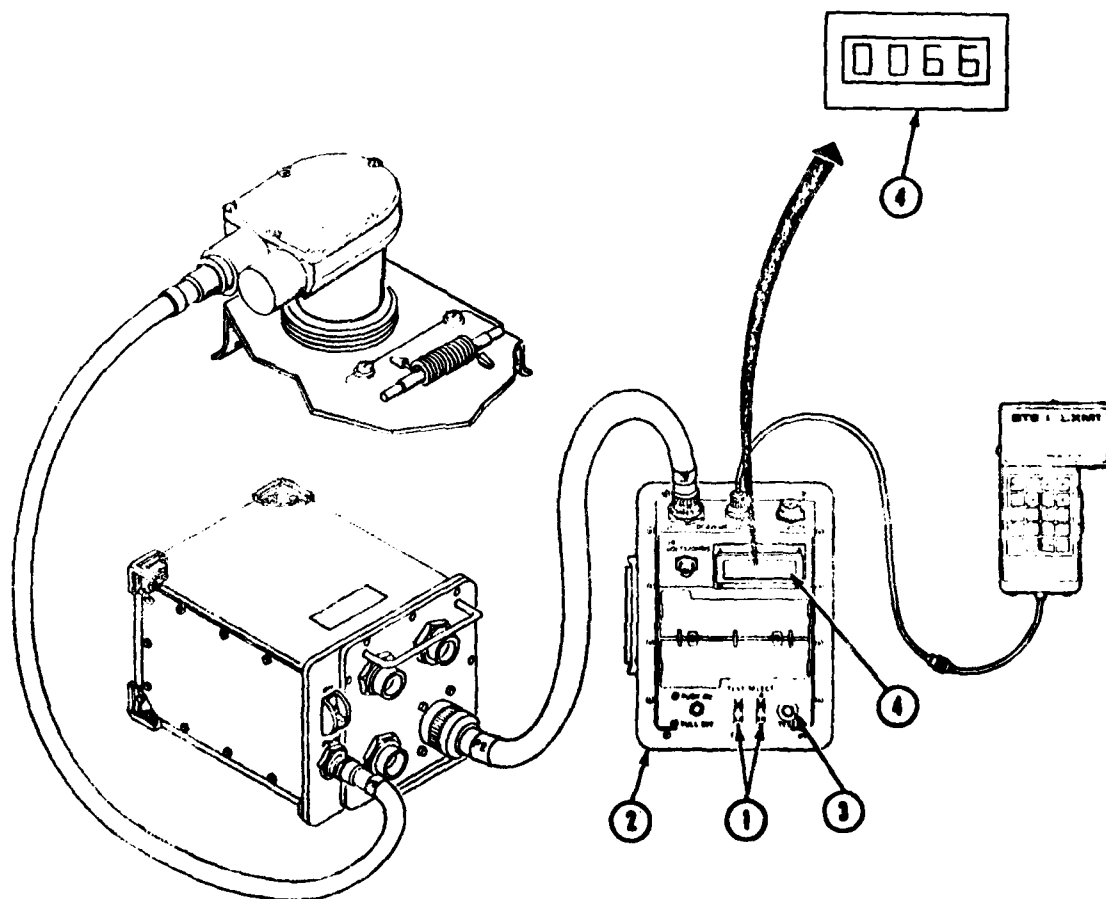
Continue Self Test:

1. Dial 66 into TEST SELECT switches (1) on Vehicle Test Meter (2).
2. Press and release TEST switch (3).
3. Check that display (4) reads 0066 .

NOTE

If display (4) does not read 0066, perform shutdown procedure in paragraph 4-6. Notify your supervisor.

GO TO FRAME 10



FRAME 10

Continue Self Test:

1. Dial 99 into TEST SELECT switches (1) on Vehicle Test Meter (2).
2. Press and release TEST switch (3).
3. Wait for display (4) to read PASS.

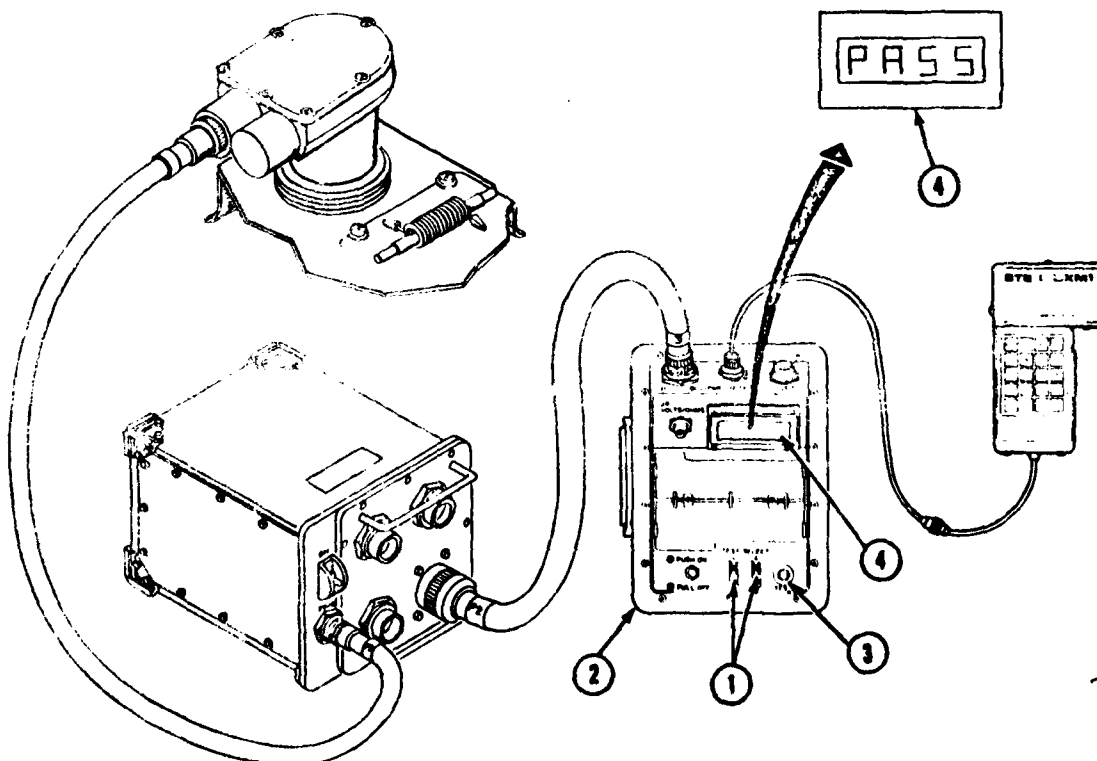
NOTE

At this point in the test, numbers will appear on display (4). Wait for display (4) to read PASS, then go to frame 11.

NOTE

If display (4) does not read PASS after waiting, perform shutdown procedure in paragraph 4-f. Notify your supervisor.

GO TO FRAME 11



FRAME 11

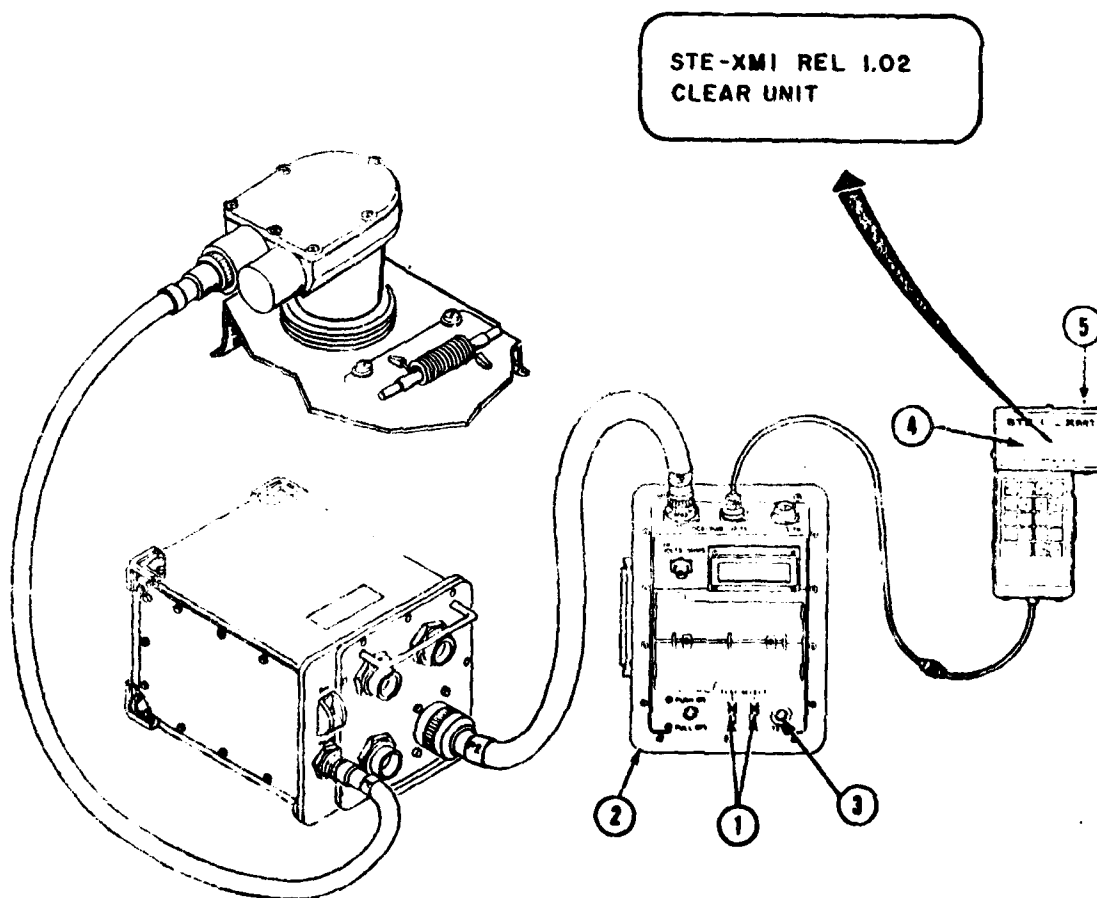
Continue Self Test:

1. Dial 00 into TEST SELECT switches (1) on Vehicle Test Meter (2).
2. Press and release TEST switch (3).
3. Check that display (4) on Set Communicator (5) reads: STE-XM1 REL 1.02
CLEAR UNIT

NOTE

If display (4) does not read message in step.3, perform shutdown procedure in paragraph 4-6. Notify your supervisor. If OK, proceed.

GO TO FRAME 12



FRAME 12

Continue Self Test:

NOTE

Continue self test by doing the steps listed in the following frames in sequence. From this point on, all testing is done using the Set Communicator.

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press CLEAR key	ENTER TEST NUMBER:	<p>Check that no cables are connected to CIB J1, J2 and J3.</p> <p>• If display reads VTM OK, go to step 7.</p> <p>NOTE</p> <p>If display reads as follows:</p> <p>BAD VTM XXXX</p> <p>(XXXX is a number. It is not used)</p> <p>Do the following steps:</p> <p>• Press GO key. Display reads:</p> <p>TEST FINISHED PUSH STOP AND CLEAR</p> <p>• Press STOP key.</p> <p>• Press CLEAR key.</p> <p>• Perform shutdown procedures in paragraph 4-6. Notify your supervisor.</p>
2.	Press 6 key three times	ENTER TEST NUMBER: 666	
3.	Press GO key	TEST 666 SELF TEST	
4.	Press GO key	REMOVE CABLES FROM CIB J1, J2, AND J3	
5.	Press GO key	VTM TEST RUNNING. PLEASE WAIT.	
6.	Wait for display to change	VTM OK	
7.	Press GO key	DO YOU WANT TO TEST SETCOM?	

GO TO FRAME 13

FRAME 13

Continue Self Test:

NOTE

If any characters are missing or display is not as shown in the following tests, perform shutdown procedure in paragraph 4-6. Notify your supervisor.

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press YES key	BUTTON TEST: PRESS RETEST	
2.	Press RETEST key	BUTTON TEST: PRESS 1	
3.	Press 1 key	BUTTON TEST: PRESS 2	
4.	Press 2 key	BUTTON TEST: PRESS 3	
5.	Press 3 key	BUTTON TEST: PRESS CAL	
6.	Press CAL key	BUTTON TEST: PRESS 4	
7.	Press 4 key	BUTTON TEST: PRESS 5	
8.	Press 5 key	BUTTON TEST: PRESS 6	
9.	Press 6 key	BUTTON TEST: PRESS SINGLE STEP	
10.	Press SINGLE STEP key	BUTTON TEST: PRESS 7	
11.	Press 7 key	BUTTON TEST: PRESS 8	
GO TO FRAME 14			

FRAME 14

Continue Self Test:

NOTE

If any characters are missing or display is not as shown in the following tests, perform shutdown procedure in paragraph 4-6. Notify your supervisor.

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press 8 key	BUTTON TEST: PRESS 9	
2.	Press 9 key	BUTTON TEST: PRESS YES	
3.	Press YES key	BUTTON TEST: PRESS 0	
4.	Press 0 key	BUTTON TEST: PRESS NO	
5.	Press NO key	BUTTON TEST: PRESS CLEAR	
6.	Press CLEAR key	BUTTON TEST: PRESS GO	
7.	Press GO key	DISPLAY TEST: 0123456789	
8.	Press GO key	ABCDEFGHIJKLM NOPQRSTUVWXYZ	
9.	Press GO key	abcdefghijklm nopqrstuvwxyz	
10.	Press GO key	19 dots on first line 19 dots on second line
11.	Press GO key	----- -----	19 dashes on first line 19 dashes on second line
GO TO FRAME 15			

FRAME 15

Continue Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	DO YOU WANT TO TEST CIB AND CABLES?	
2.	Press YES key	INSPECT CIB CONNECTORS J1 & J2	
3.	Press GO key	ARE PINS BENT OR BROKEN?	<ul style="list-style-type: none"> Look at CIB connectors J1 and J2 for bent or broken pins. If no pins are bent or broken, continue test at step 4. <p>NOTE</p> <p>If any pins on CIB connectors J1 and J2 are bent or broken, proceed as follows:</p> <ul style="list-style-type: none"> Press YES key. Display reads: FAULTY CONNECTOR 66610 (Number on display is not used) Press STOP key Press CLEAR key Perform shutdown procedure in paragraph 4-6. Notify your supervisor.
4.	Press NO key	CIB TEST RUNNING PLEASE WAIT	
5.	Wait for display to change	CIB OK	<ul style="list-style-type: none"> If display reads CIB OK, go to frame 17 to continue test. <p>NOTE</p> <p>If display has a fault message such as FAULTY CIB, VTM, go to frame 16.</p>

GO TO FRAME 17
(if display reads CIB OK)

GO TO FRAME 16
(if display has fault message)

FRAME 16**Fault Message - Stop Test:****NOTE**

You will go to this frame only if a fault message appears on the Set Communicator display. The fault message appeared when testing the CIB in frame 15. The faults that may appear are shown below.

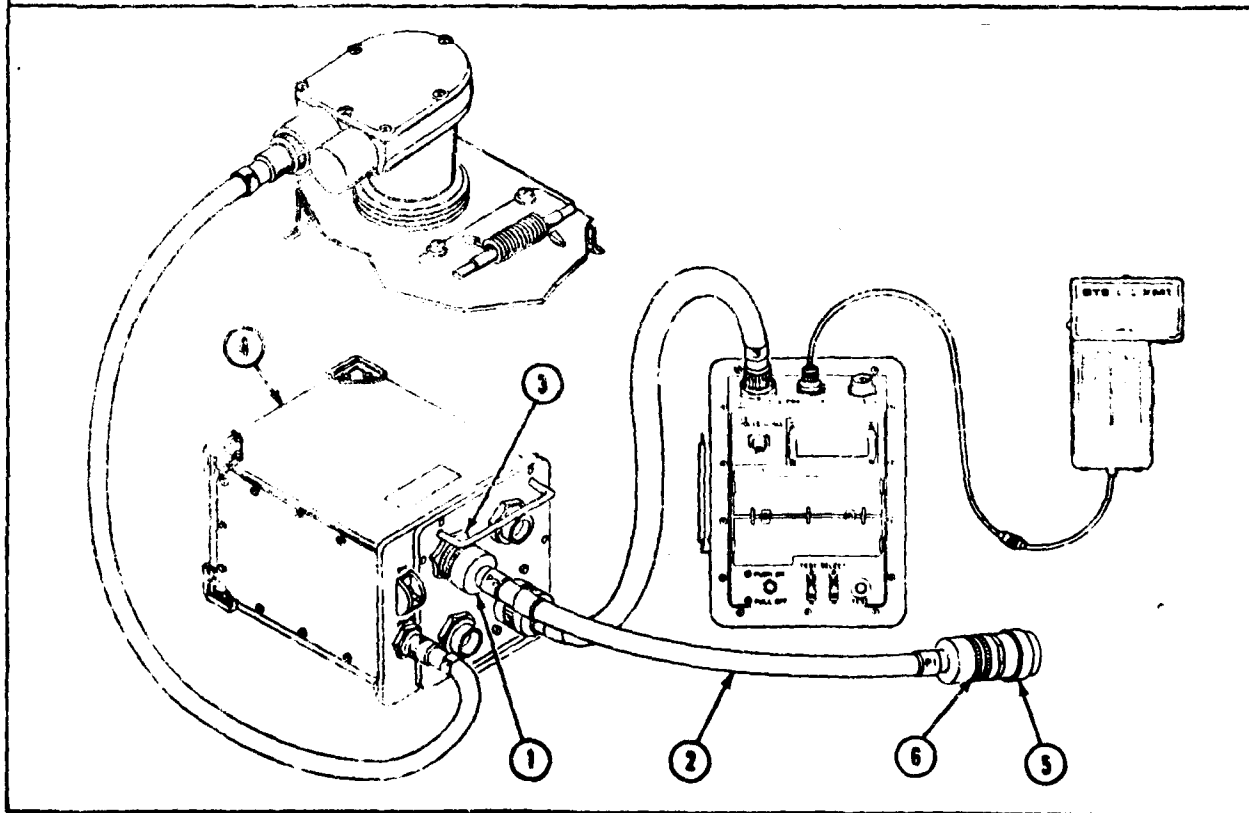
Fault Message	Operator Action	Remarks
FAULTY CIB, VTM, OR DCA CABLE 66650	<ul style="list-style-type: none"> ● Press STOP key. ● Press CLEAR key. ● Perform shutdown procedure in paragraph 4-6. ● Notify your supervisor. 	Number on display is not used. Number that appears can be 66650 through 66666.
BAD CIB XXXX (See remarks column)	<ul style="list-style-type: none"> ● Press GO. Display reads: TEST FINISHED PUSH STOP AND CLEAR ● Press STOP key, then press CLEAR key. ● Perform shutdown procedure in paragraph 4-6. ● Notify your supervisor. 	XXXX can be any one of many numbers. It is not used.
FAULTY CIB, VTM	<ul style="list-style-type: none"> ● Press STOP key. ● Press CLEAR key. ● Perform shutdown procedure in paragraph 4-6. ● Notify your supervisor. 	
END OF TASK		

FRAME 17

Continue Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	DO YOU WANT TO TEST CIB CABLES?	
2.	Press YES key	CONNECT CX304 TO CIB J1	<p>CAUTION</p> <p>Be careful when you plug in P2 connector (1) of CX304 cable (2) to J1 connector (3) on CIB (4). Connector pins can bend or break.</p> <ul style="list-style-type: none"> • Plug in P2 connector (1) of CX304 cable (2) to J1 connector (3) on CIB (4).
3.	Press GO key	CONNECT PLUG TA301 TO CX304	<p>CAUTION</p> <p>Be careful when you plug in TA301 plug (5) to P1 connector (6) of CX304 cable (2). Connector pins can bend or break.</p> <ul style="list-style-type: none"> • Plug in TA301 plug (5) to P1 connector (6) of CX304 cable (2).

GO TO FRAME 18

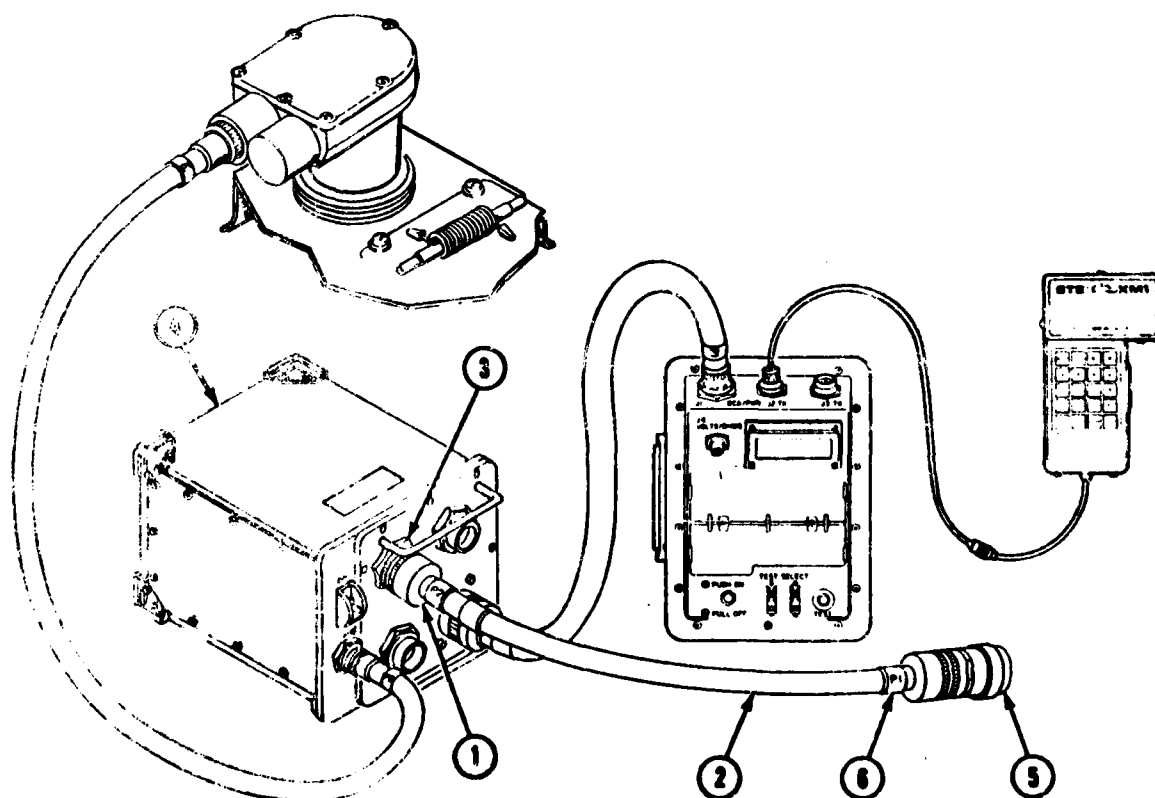


FRAME 18

Continue Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	CABLE TEST RUNNING. PLEASE WAIT.	
2.	Wait for display to change	REMOVE CX304 AND PLUG TA301	<ul style="list-style-type: none"> ● If display reads REMOVE CX304 AND PLUG TA301, go to step 3. <p>NOTE</p> <p>If display reads BAD CX304, J1, OR TA301 during cable test, go to frame 24.</p>
3.	Remove CX304 and plug TA301		<ul style="list-style-type: none"> ● Unplug P2 connector (1) of CX304 cable (2) from J1 connector (3) on CIB (4). ● Unplug TA301 plug (5) from P1 connector (6) of CX304 cable (2).

GO TO FRAME 19

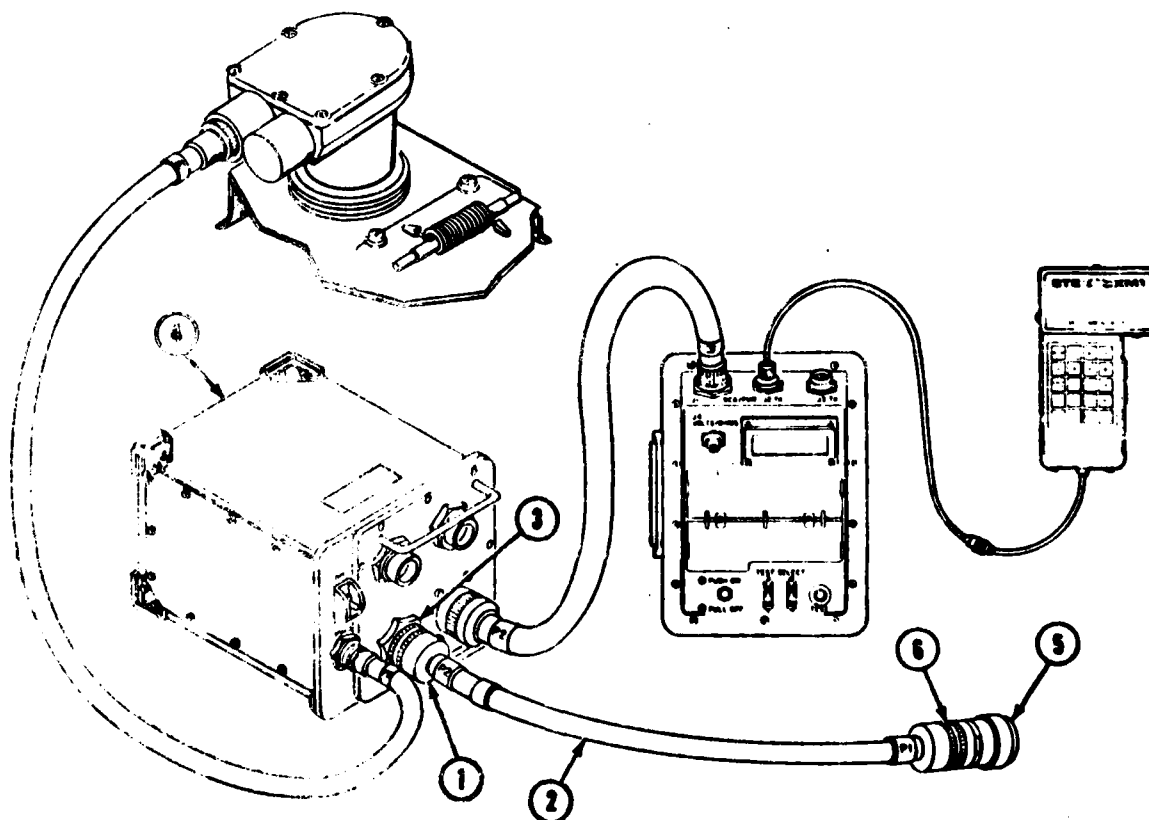


FRAME 19

Continue Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	CONNECT CX305 TO CIB J2	<p>CAUTION</p> <p>Be careful when you plug in P2 connector (1) of CX305 cable (2) to J2 connector (3) on CIB (4). Connector pins can bend or break.</p> <p>● Plug in P2 connector (1) of CX305 cable (2) to J1 connector (3) on CIB (4).</p>
2.	Press GO key	CONNECT PLUG TA301 TO CX305	<p>CAUTION</p> <p>Be careful when you plug in TA301 plug (5) to P1 connector (6) of CX305 cable (2). Connector pins can bend or break.</p> <p>● Plug in TA301 plug (5) to P1 connector (6) of CX305 cable (2).</p>

GO TO FRAME 20

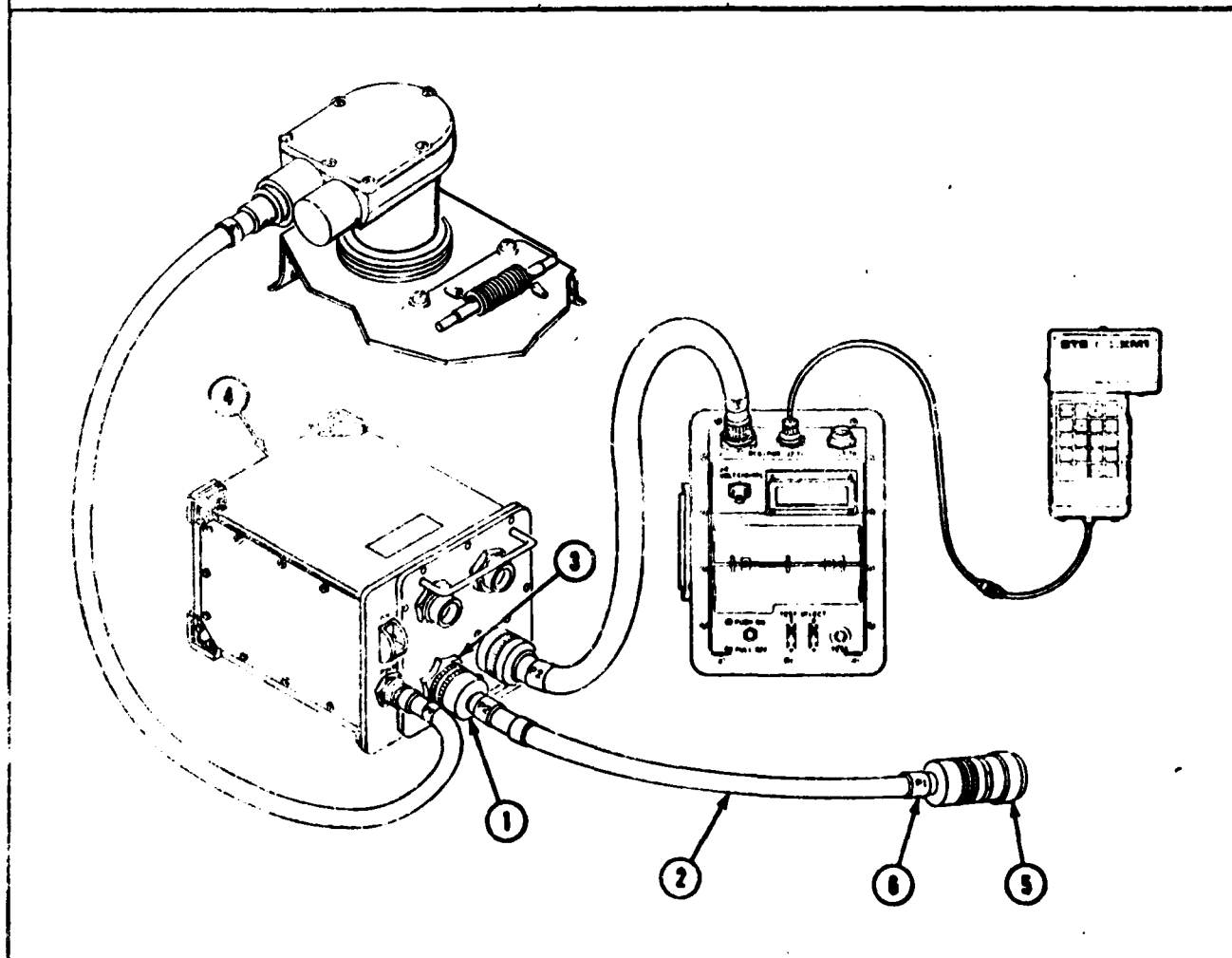


FRAME 20

Continue Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	CABLE TEST RUNNING. PLEASE WAIT.	
2.	Wait for display to change	CIB CABLES OK. NOT SHORTED.	• If display reads CABLE CONTINUITY OK, go to step 3. NOTE If display reads BAD CX305, J2, OR TA301 during cable test, go to frame 25.
3.	Press GO key	DO YOU WANT TO TEST FOR SHORTS?	

GO TO FRAME 21

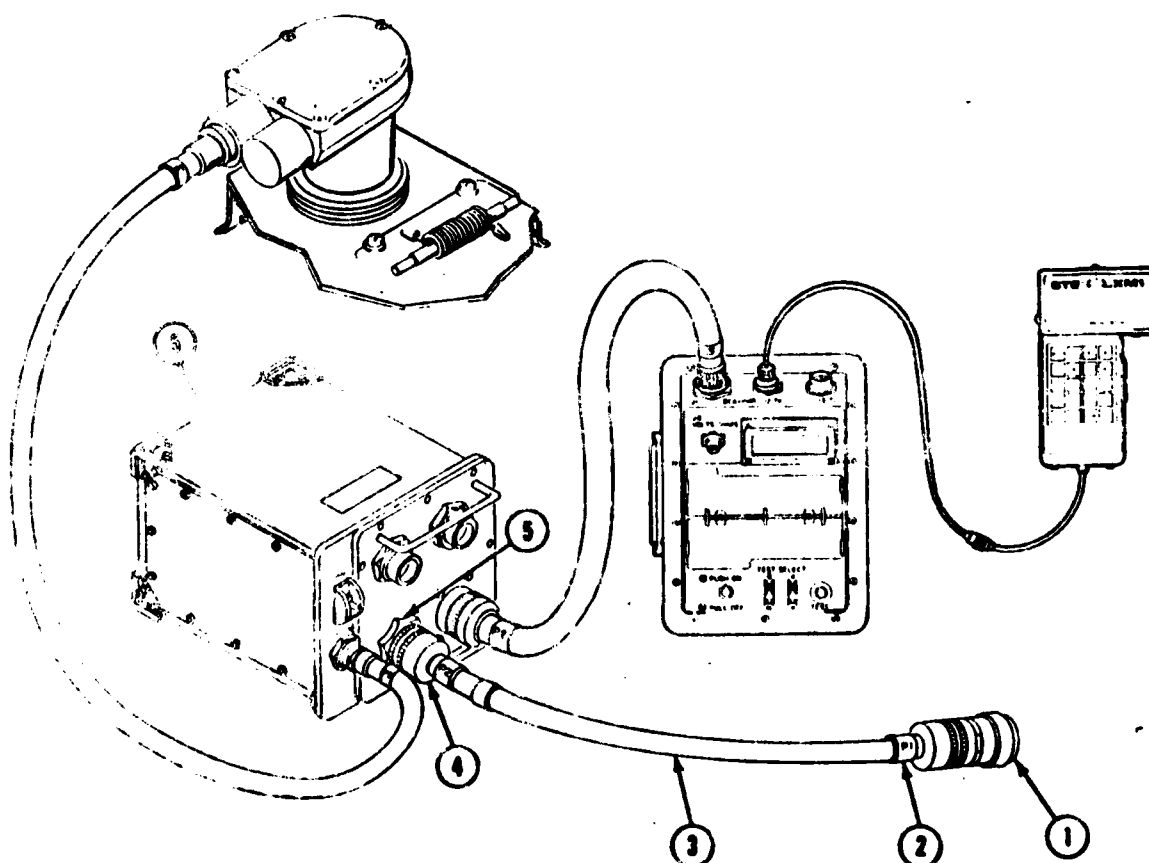


FRAME 21

Continue Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press YES key	REMOVE PLUG TA301 FROM CX305	• Unplug TA301 plug (1) from P1 connector (2) of CX305 cable (3).
2.	Press GO key	CABLE TEST RUNNING. PLEASE WAIT.	
3.	Wait for display to change	REMOVE CX305	• If display reads REMOVE CX305, go to step 4. NOTE If display reads BAD CX305, J2, OR TA301, go to frame 25.
4.	Remove CX305 cable		• Unplug P2 connector (4) of CX305 cable (3) from J2 connector (5) on CIB (5).

GO TO FRAME 22

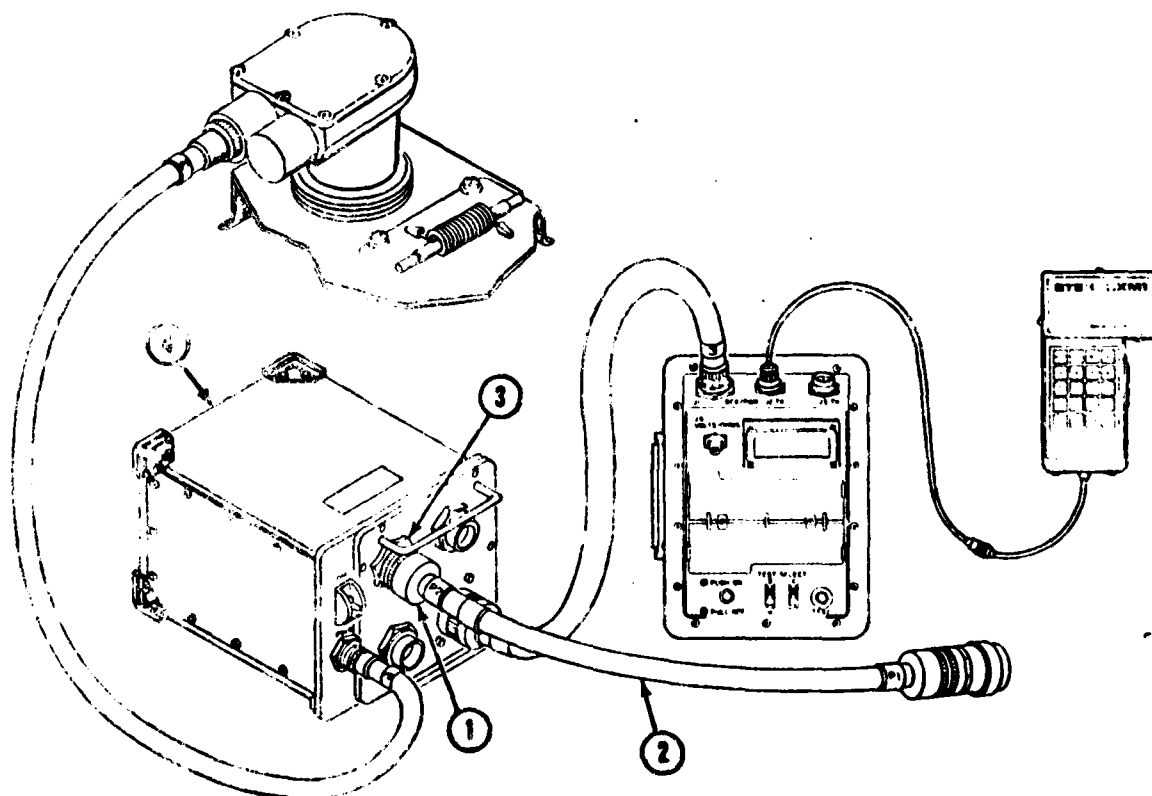


FRAME 22

Continue Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	CONNECT CX304 TO CIB J1	<p>CAUTION</p> <p>Be careful when you plug in P2 connector (1) of CX304 cable (2) to J1 connector (3) on CIB (4). Connector pins can bend or break.</p> <p>● Plug in P2 connector (1) of CX304 cable (2) to J1 connector (3) on CIB (4).</p>
2.	Press GO key	CABLE TEST RUNNING. PLEASE WAIT.	
3.	Wait for display to change	CIB CABLES OK NOT SHORTED	<p>● If display reads CIB CABLES OK NOT SHORTED, go to frame 23.</p> <p>NOTE</p> <p>If display reads BAD CX304, OR J1, go to frame 26.</p>

GO TO FRAME 23



FRAME 23

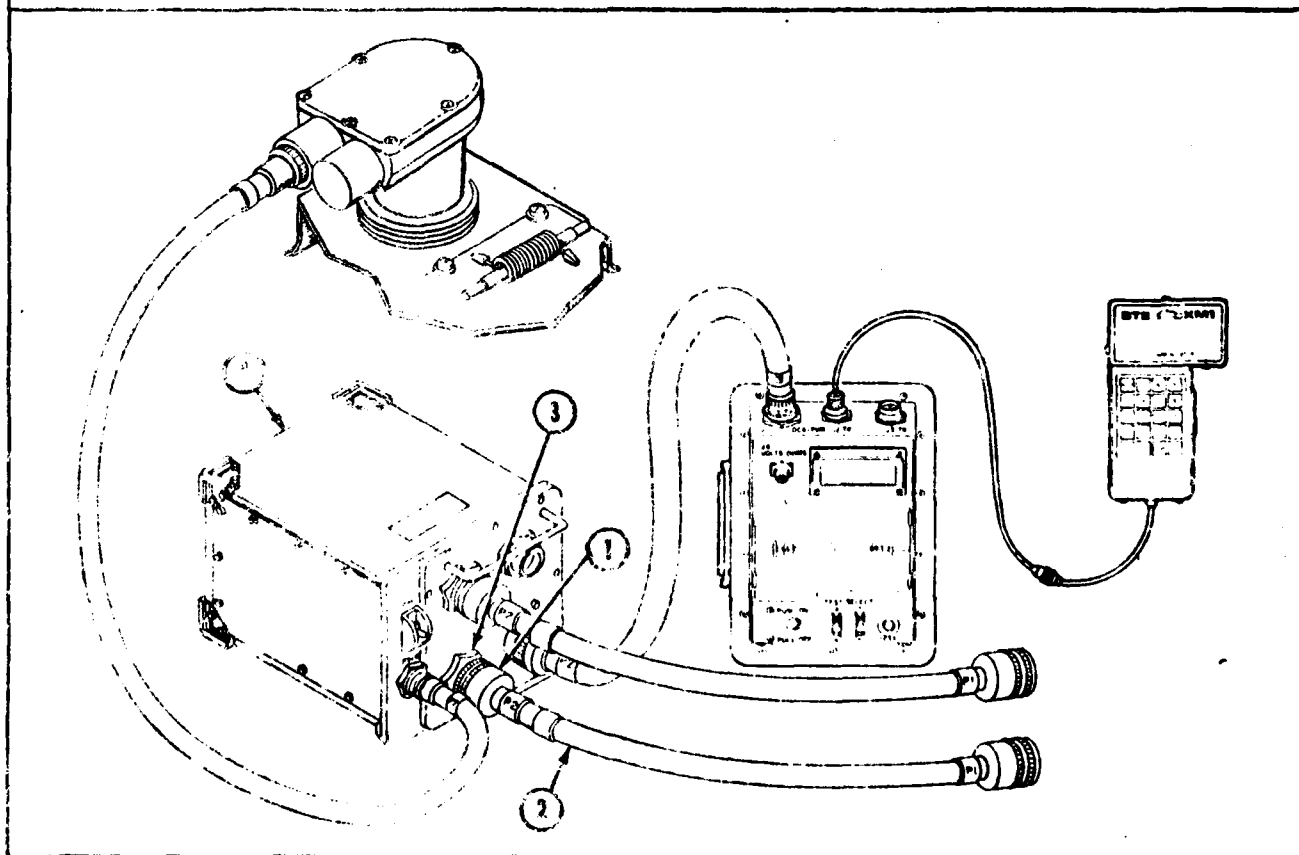
End Self Test:

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	TEST FINISHED PUSH STOP AND CLEAR	
2.	Press STOP key		
3.	Press CLEAR key	ENTER TEST NUMBER:	
4.	Connect CX305 cable to CIB		<p>CAUTION</p> <p>Be careful when you plug in P2 connector (1) of CX305 cable (2) into J2 connector (3) on CIB (4). Connector pins can bend or break.</p> <p>• Plug in P2 connector (1) of CX305 cable (2) into J1 connector (3) on CIB (4).</p>

NOTE

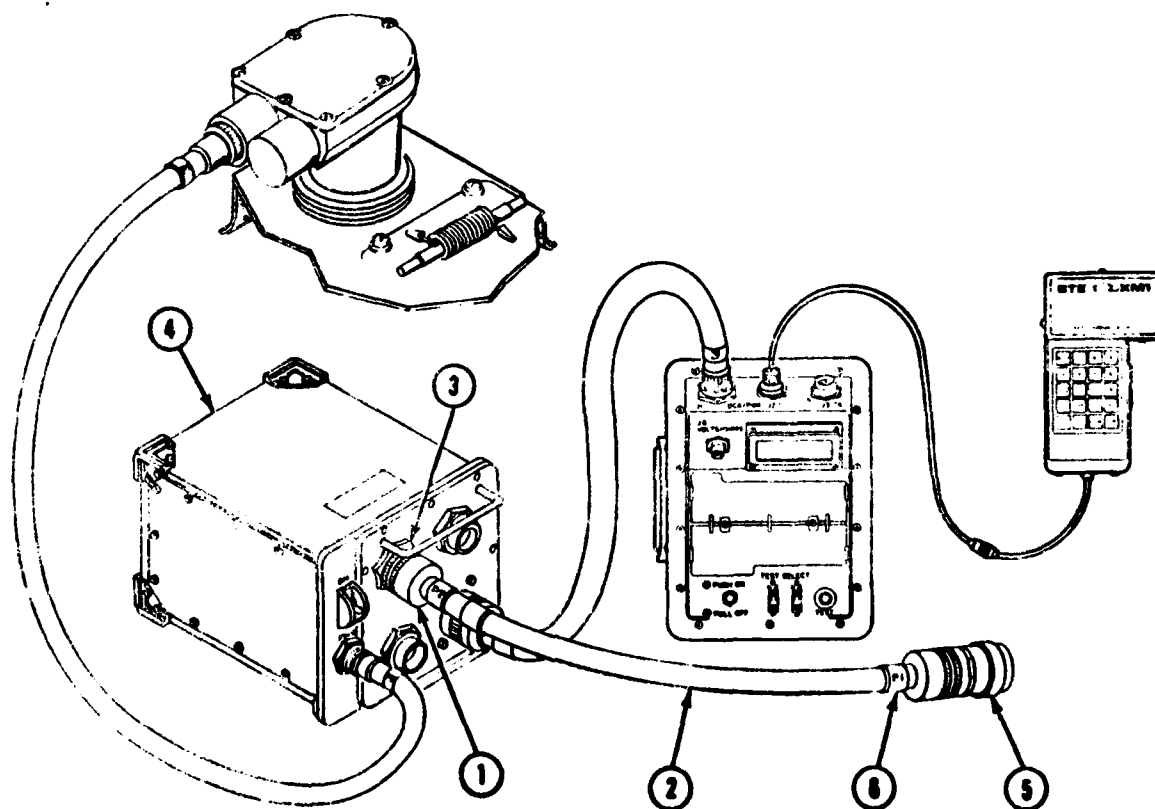
Refer to TM 92350-255-20-1-2 and TM 9-2350-255-20-2-2 for detailed procedures in using the STE/XM1 test set to checkout and troubleshoot the XM1 tank.

END OF SELF TEST



FRAME 24**Fault Message-Discontinue Testing:**

1. Press GO key. Display reads: **TEST FINISHED
PUSH STOP AND CLEAR.**
2. Press STOP key.
3. Press CLEAR key.
4. Unplug P2 connector (1) of CX304 cable (2) from J1 connector (3) on CIB (4).
5. Unplug TA301 plug (5) from P1 connector (6) of CX304 cable (2).
6. Perform shutdown procedure in paragraph 4-6. Notify your supervisor.

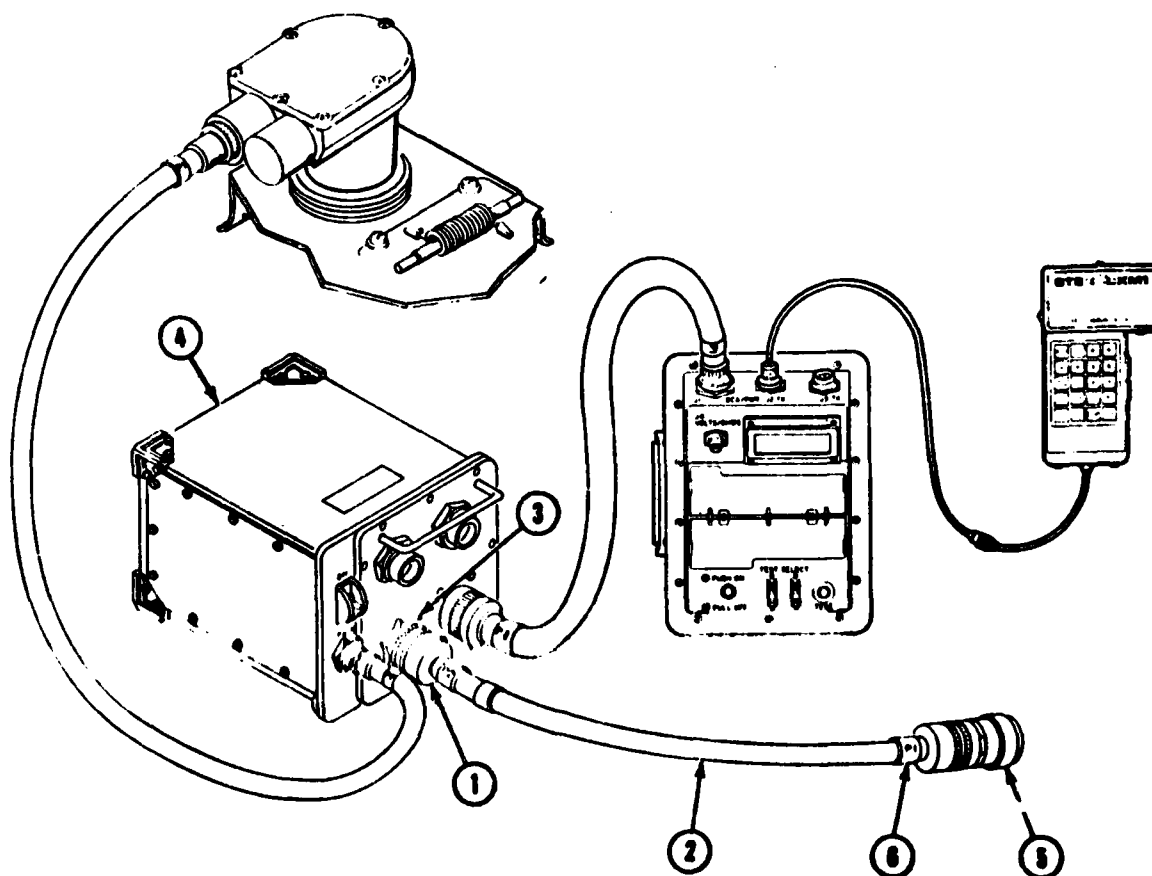
END OF TASK

FRAME 25

Fault Message-Discontinue Testing:

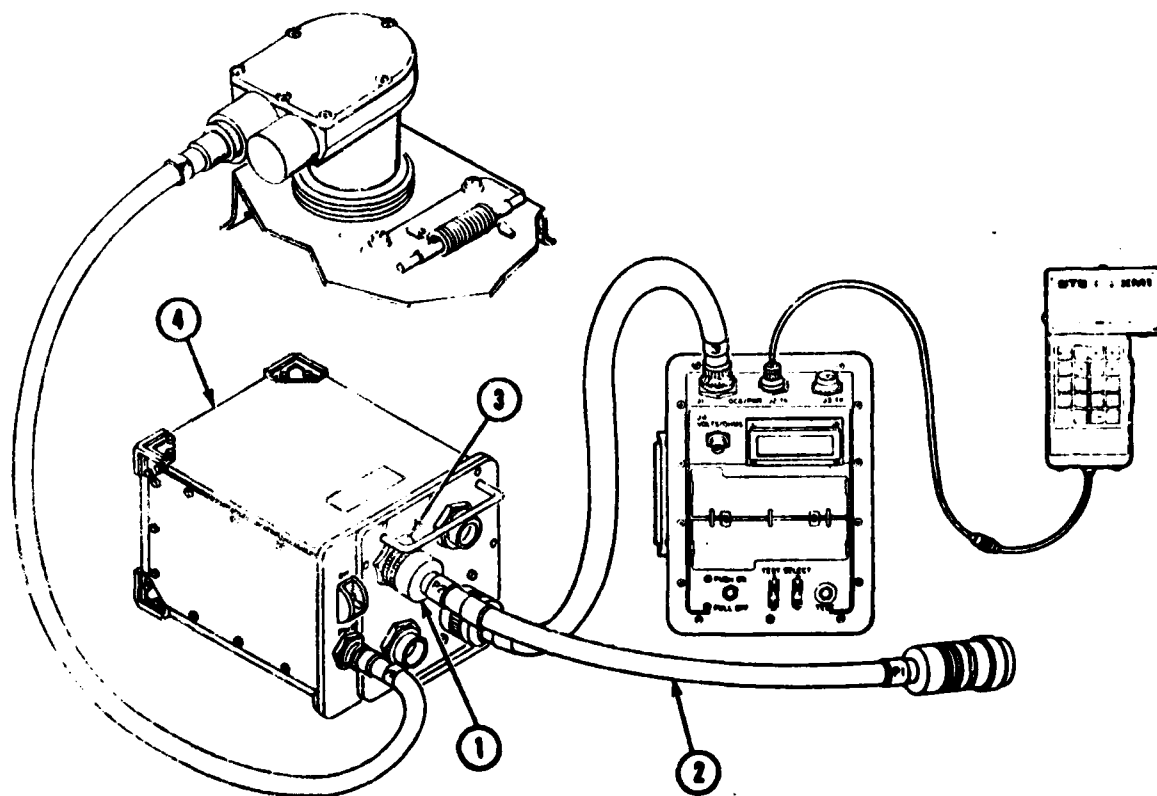
1. Press GO key. Display reads: **TEST FINISHED
PUSH STOP AND CLEAR.**
2. Press STOP key.
3. Press CLEAR key.
4. Unplug P2 connector (1) of CX305 cable (2) from J2 connector (3) on CIB (4).
5. Unplug TA301 plug (5) from P1 connector (6) of CX305 cable (2).
6. Perform shutdown procedure in paragraph 4-6. Notify your supervisor.

END OF TASK



FRAME 26**Fault Message-Discontinue Testing:**

1. Press GO key. Display reads: **TEST FINISHED
PUSH STOP AND CLEAR.**
2. Press STOP key.
3. Press CLEAR key.
4. Unplug P2 connector (1) of CX304 cable (2) from J1 connector (3) on CIB (4).
6. Perform shutdown procedure in paragraph 4-6. Notify your supervisor.

END OF TASK

#TASK 3 CONDUCT ADAPTER TEST

4-7. Adapter Test. Adapter test is a special test of the STE/XM1 Test Set cable adapters for continuity. The cable adapters tested are in the Hull and Turret test accessories transit cases. The cable adapters are tested in pairs. Each cable adapter pair is plugged together and connected by cables to the test set. The operator then does the adapter test. Steps to connect and test the cable adapter pairs are in frames 1 through 4. The cable adapter pairs are listed in the following table.

CABLE ADAPTERS TESTED IN PAIRS

Cable Adapter Pairs Hull Test Accessories		Cable Adapter Pairs Turret Test Accessories	
CA401/CA402	CA433/CA434	CA501/CA502	CA533/CA534
CA403/CA404	CA435/CA436	CA503/CA504	CA535/CA536
CA405/CA406	CA437/CA438	CA505/CA506	CA537/CA538
CA407/CA408	CA439/CA440	CA507/CA508	CA539/CA540
CA409/CA410	CA441/CA442	CA509/CA510	CA541/CA542
CA411/CA412	CA443/CA444	CA511/CA512	CA543/CA544
CA413/CA414	CA445/CA446	CA513/CA514	CA545/CA546
CA415/CA416	CA447/CA448	CA515/CA516	CA547/CA548
CA417/CA418	CA449/CA450	CA517/CA518	CA549/CA550
CA419/CA420	CA451/CA452	CA519/CA520	CA551/CA552
CA421/CA422	CA453/CA454	CA521/CA522	CA553/CA554
CA423/CA424	CA455/CA456	CA523/CA524	CA555/CA556
CA425/CA426	CA457/CA458	CA525/CA526	CA557/CA558
CA427/CA428	CA459/CA460	CA527/CA528	CA559/CA560
CA429/CA430	CA461/CA462	CA529/CA530	CA561/CA562
CA431/CA432	CA463/CA464	CA531/CA532	CA563/CA564

Preliminary Procedures:

1. Unlatch and take off the cover on the Engine/Stabilization DBA Accessories transit case. Take out the following items:

- 2 cables CX207

Put on and latch the cover on the transit case.

2. Unlatch and take off the cover on the Hull Test Accessories transit case. Take out the following items:

- Cable Adapter CA455
- Cable Adapter CA456

Put on and latch the cover on the transit case.

FRAME 1**Do Adapter Test:****NOTE**

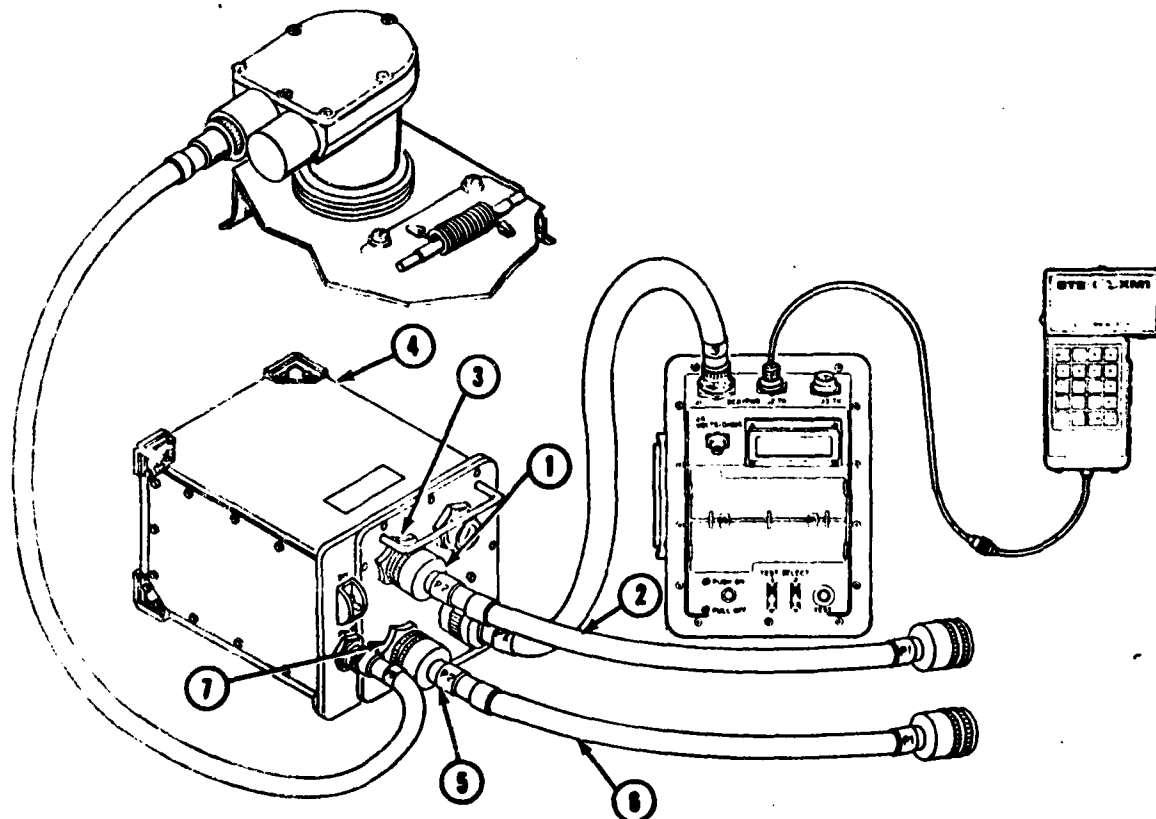
Following is a typical cable adapter test which checks cable adapter pair CA455/CA456. The test can be used for any of the adapter pairs listed in the table of paragraph 4-7. Use the numbers of the adapter pair you are testing in place of CA455/CA456.

NOTE

If you are doing tests on the XM1 tank, and the test set is already set up, do steps 2 and 3 only and go to frame 2. If the test set is not set up as shown below, do step 1, then go to frame 2.

1. Do the set up procedure in paragraph 4-5.
2. Plug P2 connector (1) of CX304 cable (2) into J1 connector (3) on CIB (4).
3. Plug P2 connector (5) of CX305 cable (6) into J2 connector (7) on CIB (4).

GO TO FRAME 2

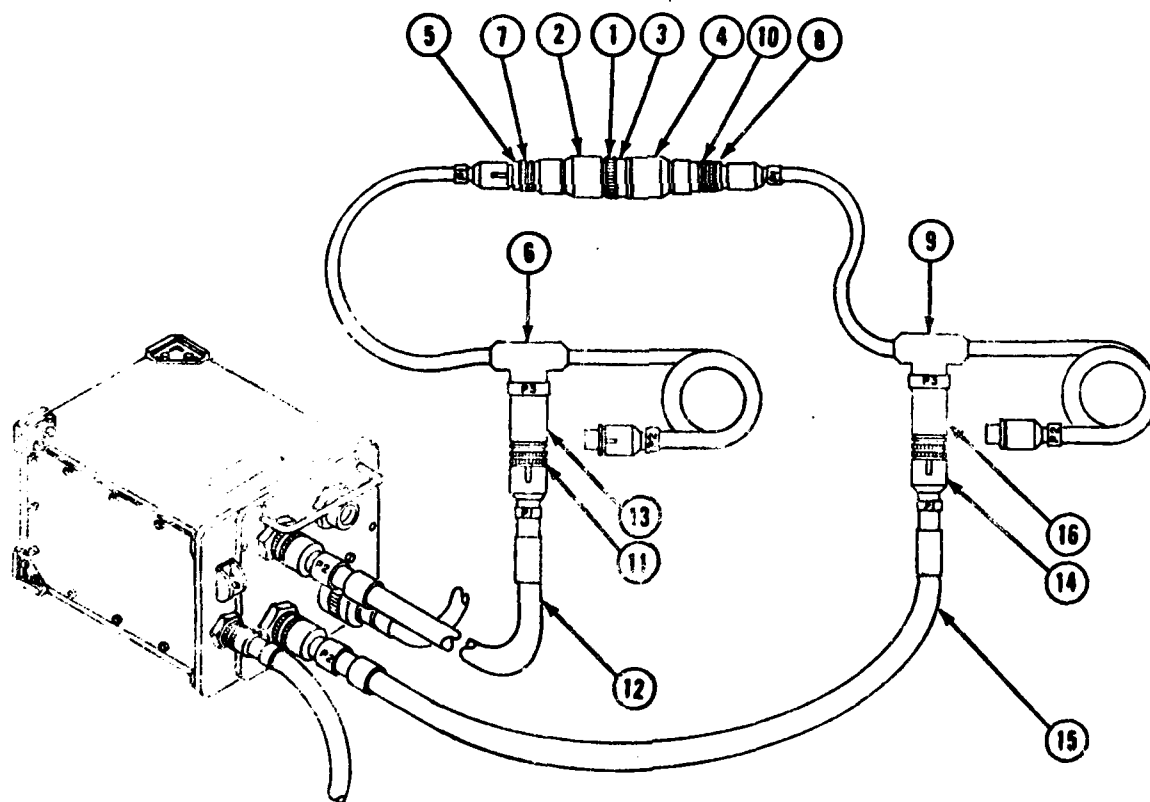


FRAME 2

Continue Adapter Test:

1. Plug in P1 connector (1) of CA455 adapter (2) to P1 connector (3) of CA456 adapter (4).
2. Plug in P1 connector (5) of one CX207 cable (6) to P2 connector (7) of CA455 adapter (2).
3. Plug in P1 connector (8) of second CX207 cable (9) to P2 connector (10) of CA455 adapter (4).
4. Plug in P1 connector (11) of CX304 cable (12) to P3 connector (13) of CX207 (6).
5. Plug in P1 connector (14) of CX305 cable (15) to P3 connector (16) of CX207 cable (9).

GO TO FRAME 3



NOTE - PARTIAL TEST SETUP
SHOWN FOR CLARITY.

FRAME 3

Continue Adapter Test:

NOTE

This test is done using Set Communicator.

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press keys 6, 6, 8	TEST 668 ADAPTER TEST	
2.	Press GO key	WHAT ADAPTER? CA	
3.	Press keys 4, 4, 5	ADAPTER PAIR TO BE TESTED: CA455 & CA456	<p>NOTE</p> <p>Only one number of adapter pair has to be entered.</p> <p>NOTE</p> <p>If wrong number is entered (for example, 789), press CLEAR key and go back to step 1. Typical display for wrong number reads:</p> <p>NO ADAPTER: CA789 WHAT ADAPTER? CA</p>
4.	Press GO key	USE: CA455, CA456 AND TWO CX207s	
5.	Press GO key	ASSEMBLE CIB CABLE, CX207 AND CA455	<ul style="list-style-type: none"> • Check that one CX207 cable is plugged into CX304 cable and to adapter CA455.
6.	Press GO key	CONNECT CIB CABLE TO CIB J1	<ul style="list-style-type: none"> • Check that CX304 cable is plugged into J1 on CIB.
7.	Press GO key	ASSEMBLE CIB CABLE, CX207 AND CA456	<ul style="list-style-type: none"> • Check that second CX207 cable is plugged into CX305 cable and to adapter CA456.
8.	Press GO key	CONNECT CIB CABLE TO CIB J2	<ul style="list-style-type: none"> • Check that CX305 cable is plugged into J2 on CIB.
9.	Press GO key	CONNECT CA455 TO CA456	<ul style="list-style-type: none"> • Check that adapter CA455 is plugged into CA456.
GO TO FRAME 4			

FRAME 4**Continue Adapter Test:**

Step	Operator Action	Set Communicator Display	Operator Action/Remarks
1.	Press GO key	6000	<p>NOTE</p> <p>If display reads as follows:</p> <p>BAD: X</p> <p>(X is a number)</p> <p>either the adapter pair or cable assembly has failed the test.</p> <ul style="list-style-type: none"> ● Press GO key. Display reads FAULTY ADAPTER OR DBA. ● Press GO key. Display reads WANT TO PERFORM ANOTHER ADAPTER TEST? ● If you want to do the test over, press YES key and start at step 2, frame 3. ● If you do not want to do the test again, press NO key. Display reads TEST FINISHED PUSH STOP AND CLEAR. ● Press STOP key then press CLEAR key.
2.	Press GO key	TEST OK	
3.	Press GO key	WANT TO PERFORM ANOTHER ADAPTER TEST?	<ul style="list-style-type: none"> ● If you want to do another adapter test, press YES key. If not, go to step 4.
4.	Press GO key	TEST FINISHED PUSH STOP AND CLEAR	<ul style="list-style-type: none"> ● Press STOP key. ● Press CLEAR key.
END OF ADAPTER TEST			

#TASK 4 SHUT-DOWN STE/XM1 TEST SET

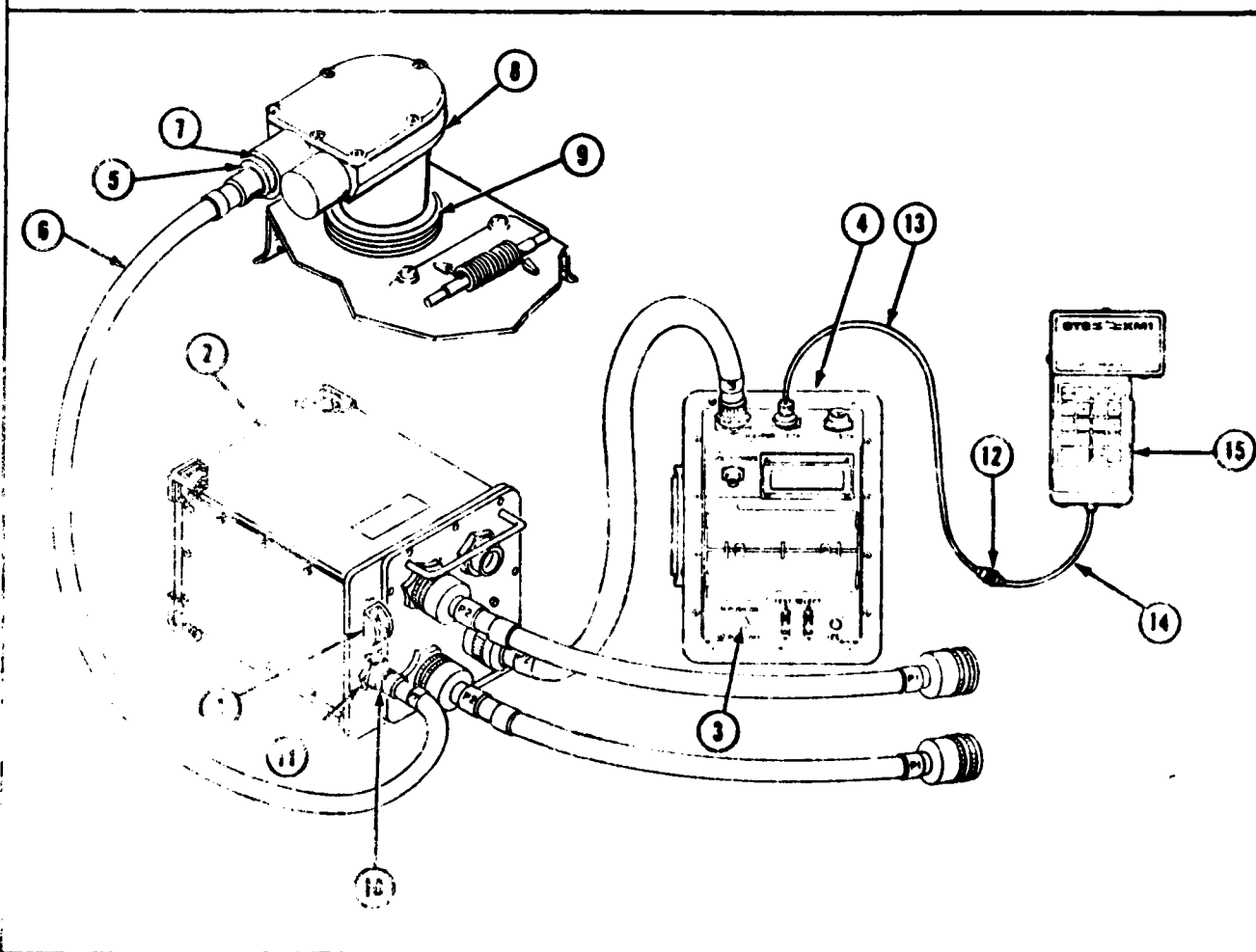
4-6 Shutdown. This paragraph has frame pages with steps that tell you how to shutdown the STE/XMI Test Set.

FRAME 1

Shut Off Power, Remove Cables:

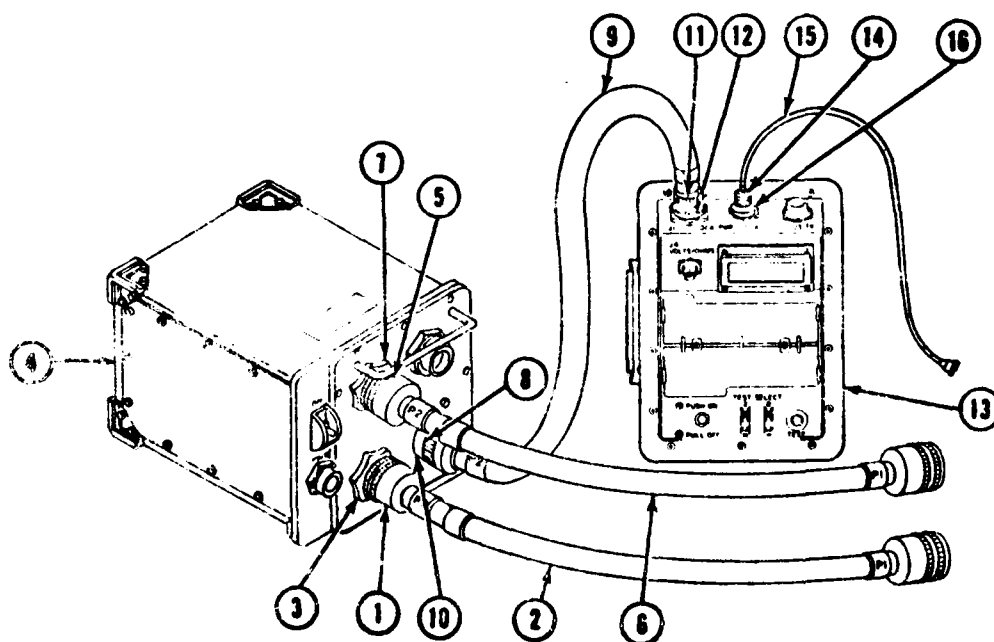
1. Set ON/OFF switch (1) on Controllable Interface Box (2) to OFF.
2. Pull circuit breaker (3) on Vehicle Test Meter (4) to OFF.
3. Unplug P1 connector (5) of CX306 cable (6) from P2 connector (7) of NATO adapter (8).
4. Unplug NATO adapter (8) from slave receptacle (9). Put NATO adapter (8) into VTM/Transducer, Set Communicator assembly transit case.
5. Unplug P2 connector (10) of CX306 cable (6) from J5 connector (11) on CIB (2). Put CX306 cable (6) into Test Cables and Adapter transit case.
6. Unplug P2 connector (12) of CX603 cable (13) from Set Communicator cable (14).
7. Put Set Communicator (15) into VTM/Transducer, Set Communicator transit case.

GO FRAME 2



FRAME 2**Remove Cables:**

1. Unplug J2 connector (1) of CX305 cable (2) from J2 connector (3) on CIB (4).
2. Unplug J2 connector (5) of CX304 cable (6) from J1 connector (7) on CIB (4).
3. Put CX304 and CX305 cables (2), (6) in Test Cables and Adapters transit case.
4. Unplug P2 connector (8) of W1 cable (9) from J4 connector (10) on CIB (4).
5. Unplug P1 connector (11) of W1 cable (9) from J1 connector (12) on VTM (13).
6. Unplug P1 connector (14) of CX603 cable (15) from J2 connector (16) on VTM (13).
7. Put VTM (13) and W1 cable (9) in VTM/Transducer, Set Communicator assembly transit case.
8. Put CIB (4) in Controllable Interface Assembly transit case.
9. Put CX603 cable (15) into Fire Extinguisher Accessories transit case.

END OF TASK

APPENDIX G
TURRET ELECTRICAL SYSTEM

LESSON PLAN OUTLINE

TURRET ELECTRICAL SYSTEM

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 16 tasks in the Turret Electrical System module.

CONDITIONS: As described in the PRELIMINARY and FOLLOW ON PROCEDURES.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the students and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The procedures described under MECHANIC WILL for each task are derived from Task and Skill Analysis Report, Final, [XML] for the Tank, Combat, Full Tracked 105-MM Gun. Chrysler Corporation, 1979. There is a possibility that the procedures have changed with design changes in the XML. The procedures should be updated for the XML based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XML procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

One task in this module (Task 2.16.4.1) has two maintenance prerequisite tasks which can be taught according to the lesson plan outline for the module. Mechanics must be taught these prerequisite tasks before preceding with the module. The two prerequisite tasks are:

1. Zero hydraulic pressure.
2. Build up hydraulic pressure.

¹Boldovici, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

XM1 45E TURRET MECHANIC COMPONENT OUTLINE

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Commander's Control Panel (2.16.1)

PERFORMANCE OUTCOMES:

Mechanic will:

***2.16.1.3 Replace Commander's control panel indicator lamps or lenses. (3 minutes)**

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

Task 2.16.1.3

- a.** Commander's panel lights come on when PANEL LIGHTS TEST pushbutton is pushed.
- b.** Lenses not cracked.

***TASK 2.16.1.3 REPLACE COMMANDER'S CONTROL PANEL INDICATOR LAMPS OR LENSES**

PARTS:	Lamp (MS25237-387) Lens (M3661-35LC35YN2) (M3661-35LC35RN2) (M3661-35LC35GN2)
TOOLS:	None
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: This procedure applies to all seven lamps and seven lenses on commander's control panel.

1. Unscrew lens from panel by hand.
2. Remove lens and lamp from panel.
3. Remove lamp from lens.
4. Discard defective part.
5. Place lamp in lens.
6. Place lens and lamp into panel.
7. Screw lens into panel.

FOLLOW ON PROCEDURES:

None

REFERENCES:

Drawing No. XM61230

TIME:

3 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Loader's panel (2.16.2)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.16.2.3 Replace Loader's panel indicator lamps or lenses.
(3 minutes)**

MEASUREMENT:

(for each task)

During Training: **Time - Between end of initiating stimuli and completion of task.**
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: **Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.**
 Accuracy - As indicated by:

- Task 2.16.2.3** **a. Loader's panel lights come on when Commander's PANEL LIGHTS TEST push-button is pushed.**
 b. Lenses not cracked.

***TASK 2.16.2.3 REPLACE LOADER'S PANEL INDICATOR**

PARTS: Lamp, incandescent (MS25237-387)
Lens (M3661-35LC35YN2)
(M3661-35LC35WT2)

TOOLS: None

EXPENDABLES: None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: This procedure applies to all five lamps
and five lenses on loader's panel.

1. Unscrew lens from panel by hand.
2. Remove lens and lamp from panel.
3. Remove lamp from lens.
4. Discard defective part.
5. Place lamp in lens.
6. Place lens and lamp into panel.
7. Screw lens into panel.

FOLLOW ON PROCEDURES:

None

REFERENCES:

Drawing No. XM65440

TIME:

2 minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Turret Electrical System (2.16)

COMPONENT:

*Turret Networks Box (2.16.3)

PERFORMANCE OUTCOMES:

Mechanic will:

2.16.3.7 Replace turret networks box. (1 hour)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

Task 2.16.3.7 a. Wiring harnesses connected to turret networks box from bottom up.

TASK 2.16.3.7 REPLACE TURRET NETWORKS BOX

PARTS:	Washer, lock, 16 ea. (MS35333-39) Turret networks box assembly (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 5/16 inch Socket, socket wrench, 3/8 inch square drive, 9/16 inch Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Universal joint, socket wrench, 3/8 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Remove hull-turret slip ring cover (see Task 2.15.15.1).
2. Remove turret basket ammo rack.

MECHANIC WILL:

1. Remove four screws, washers, and lockwashers from guard using 9/16 inch socket and handle.
2. Discard lockwashers.
3. Remove guard.
4. Unscrew and remove 13 wiring harnesses from top to bottom from networks box.
NOTE A: One end of jumper cable will remain on ground plate in step 4.
5. Unscrew and two lockwashers securing jumper cable using 5/16 inch socket and handle.
6. Discard lockwashers.
7. Remove two screws and lockwashers securing bracket to shock mount using 9/16 inch socket and handle.
8. Discard lockwashers.
9. Remove three screws and six lockwashers from two lower shock mounts using 9/16 inch universal joint, socket, extension, and handle.
10. Discard lockwashers.
11. Unscrew and remove networks box.
12. Unscrew two screws and lockwashers securing bracket to box using 9/16 inch socket and handle.

***TASK 2.16.3.7 REPLACE TURRET NETWORKS BOX**

13. Discard lockwashers.
14. Remove bracket.
15. Turn in box.
16. Put bracket in place on box.
17. Secure with two screws and new lockwashers using 9/16 inch socket and handle.
18. Put networks box in place.
19. Secure box with three screws and six new lockwashers using 9/16 inch universal joint, socket, extension, and handle.
20. Secure bracket to upper shock mount with two screws and new lockwashers using 9/16 inch socket and handle.
21. Secure jumper cable to box with one new lockwasher on each side of cable terminal.
22. Screw into box with screw using 5/16 inch socket and handle.
23. Reconnect 13 wiring harnesses to box from bottom up.
24. Put guard in place and secure with four screws, washers, and new lockwashers using 9/16 inch socket and handle.

FOLLOW ON PROCEDURES:

1. Install turret basket ammo rack.
2. Install hull-turret slip ring cover.

REFERENCES:

OPC 5 1250-255-20-2-3-2; pp. 5-19 to 5-23.

TIME:

1 Hour

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Hull-Turret Slipring Unit Assembly (2.16.4)

PERFORMANCE OUTCOMES:

Mechanic will:

*/#2.16.4.1 Replace hull-turret slipring. (4 hours, 36 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

- | | |
|---------------|---|
| Task 2.16.4.1 | <u>A. Removing Slipring Unit</u> |
| | a. Hydraulic tubes plugged. |
| | b. Air hoses plugged. |
| | c. Electrical plugs and receptacles capped and tagged. |
| | d. Hydraulic fluid drained out of slipring unit. |
| | e. Elbows and fittings put in plastic bag. |
| | g. Slipring unit plugged. |
| | <u>B. Installing Slipring Unit</u> |
| | a. Mounting screws holding slipring unit in place torqued between 32 and 40 foot-pounds (43 to 54 newton meters). |
| | b. Electrical plugs attached to receptacles on top and bottom of slipring unit. |
| | c. Air hose attached to top and bottom of slipring unit. |

XM1 45E TURRET MECHANIC (Cont'd.)
COMPONENT OUTLINE

- d. Hydraulic tubes attached to top and bottom of slipring unit.
- e. Hydraulic fluid level above ADD 1 GAL mark.
- f. Pop-out indicators closed.
- g. Filtered air coming through Commander's gas particulate unit.
- h. Screws holding slipring unit cover in place torqued between 30 and 36 foot-pounds (40.5 to 48.5 newton meters).

PARTS:	Washer, lock, 4 ea. (NPN) Slipring unit (XM65660)
TOOLS:	Socket, socket wrench, 1/2 inch square drive, 9/16 inch Extension, socket wrench, 1/2 inch square drive, 10 inch Handle, socket wrench, ratchet, 1/2 inch square drive Wrench, open end, 1 1/2 inch Wrench, open end, 1 5/8 inch Wrench, torque, 0 to 175 foot-pounds Wrench, adjustable, 6 inch Wrench, open end, 9/16 inch Wrench, open end, 5/16 onch Bleed assembly, adjustable, elevation cylinders, XM66874
EXPENDABLES:	Rags, wiping Bag, plastic Hydraulic fluid, MIL-H-46170 Amendment 1 Caps and plugs, protective, MIL-C-5501 (assorted sizes)

PRELIMINARY PROCEDURES:

1. Depress main gun.
2. Bleed off pressure in hydraulic system.
3. Remove turret platform shield/blanket.

MECHANIC WILL:

1. Remove four screws, lockwashers, and washers from slip ring cover using socket and handle.
2. Discard lockwashers.
3. Remove cover.
4. Inspect shield for cracks or bad dents.
NOTE A: If not damaged, go to step 9. If damaged, go to step 5.
5. Remove two nuts using socket, extension, and handle holding two screws with adjustable wrench.
6. Remove shield from slipring cover and turn in.
7. Put new shield on slipring cover and line up holes.
8. Put two screws through holes and screw on two nuts using adjustable wrench to hold screw and socket, extension, and handle on nut.
9. Remove two hydraulic tubes from top of slipring unit using 1 1/2 inch open end wrench.

*//TASK 2.16.4.1 REPLACE HULL-TURRET SLIPRING (Cont'd.)

10. Plug two hydraulic tubes.
11. Remove one air hose from top of slipring unit using 1 1/2 inch open end wrench.
12. Plug air hose.
13. Remove five electrical plugs from five receptacles on top of unit.
14. Cap and tag plugs and receptacles.
15. Remove two hydraulic tubes from bottom of slipring unit using 1 1/2 inch open end wrench.
16. Plug two tubes.
17. Remove one air hose from bottom of slipring unit using 1 5/8 inch open end wrench.
18. Plug air hose.
19. Remove five electrical plugs from five receptacles from bottom of unit.
20. Cap and tag plugs and receptacles.
21. Remove four mounting screws and washers from bottom of unit using socket and handle.
22. Lift out slipring unit.
23. Remove six elbows using 1 5/8 inch open end wrench.
24. Remove six fittings using 1 1/2 inch open end wrench.
25. Put elbows and fittings in plastic bag.
26. Drain remaining hydraulic fluid out of slipring unit.
27. Wipe excess fluid off unit with clean rag.
28. Plug all openings on slipring unit and turn it in.

To Install Slipring Unit:

29. Screw in and tighten six fittings on new slipring unit using 1 1/2 inch open end wrench.
30. Screw in and tighten six elbows on slipring unit using 1 5/8 inch open end wrench.
31. Lower slipring unit through access hole in turret floor.
32. Put unit in place.
33. Unplug all openings on slipring unit.
34. Screw in and tighten four mounting screws and washers using socket and handle.
35. Torque four mounting screws between 32 and 40 foot-pounds (43 to 54 newton meters) using torque wrench.

*/#TASK 2.16.4.1 REPLACE HULL-TURRET SLIPRING (Cont'd.)

36. Uncap and untag five electrical plugs and receptacles.
37. Screw in and tighten five electrical plugs to receptacles on bottom of slipring unit.
38. Uncap air hose.
39. Screw in and tighten air hose to bottom of unit using 1 5/8 inch open end wrench.
40. Uncap two hydraulic tubes.
41. Screw in and tighten tubes to bottom of unit using 1 1/2 inch open end wrench.
42. Uncap and untag five electrical plugs and receptacles.
43. Screw in and tighten plugs to receptacles on top of unit.
44. Uncap air hose.
45. Screw in and tighten air hose near top of unit using 1 1/2 inch open end wrench.
46. Uncap two hydraulic tubes.
47. Screw in and tighten tubes to top of unit using 1 1/2 inch open wrench.
48. Wipe excess fluid off unit with clean, soft rag.
49. With hydraulic system pressure gage at zero, look at sight gage. Fluid level should be above ADD 1 GAL. mark. If not, fill reservoir as follows:
 - a. Traverse turret until basket opening faces reservoir.
 - b. Remove cap on filler plug and add fluid.
 - c. Replace cap.
50. Visually check two pop-out indicators for evidence of filter bypass. (If popped, close.)
51. Bleed hydraulic system of air (see Task 2.7.4.3).

NOTE A: Tell Driver to start engine and perform after start checks.
52. Traverse turret 360 degrees in power mode.
53. Operate commander's gas particulate unit to insure that filtered air is coming through.
54. Put cover on access hole.
55. Screw in and tighten four screws, washers, and new lockwashers using socket and handle.
56. Torque four screws between 30 and 36 foot-pounds (40.5 and 48.5 newton meters) using torque wrench.

BEST AVAILABLE COPY

***/*TASK 2.16.4.1 REPLACE HULL-TURRET SLIPRING (Cont'd.)**

FOLLOW ON PROCEDURE:

- 1. Install turret platform shield/blanket.**

REFERENCES:

DEP 9-2350-255-20-2-3-2.

TIME:

4 Hours, 36 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Blasting Machine Assembly (2.16.5)

PERFORMANCE OUTCOMES:

Mechanic will:

#2.16.5.2 Test blasting machine (12 minutes)

***2.16.5.5 Replace blasting machine (24 minutes)**

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

Task 2.16.5.2	Blasting machine handle springs back to normal and tester light flashes when blasting machine handle is turned clockwise two or three times and released.
---------------	---

Task 2.16.5.5	<ul style="list-style-type: none">a. Nut holding bottom stud of blasting machine in slot of brackets torqued between 24 and 30 inch-pounds (3 to 4 newton meters).b. Screw through wire lug in bracket torqued between 27 and 32 inch-pounds (3 to 4 newton meters).c. Blasting machine and bracket attached to mount bracket.d. Electrical plug attached to receptacle.
----------------------	---

#TASK 2.16.5.2 TEST BLASTING MACHINE

PARTS:	None
TOOLS:	Tester, firing circuit
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Place MASTER POWER switch on commander's control panel to ON position and release.
2. Place TURRET POWER switch on commander's control panel to ON position.
3. Place GUN SELECT switch on GPs to MAIN position.
4. Move spend case ejection guard to AUTO position.
5. Connect firing circuit tester in normal.
6. Turn blasting machine handle clockwise vigorously two or three times and release.

NOTE: A. Handle should spring back to normal position and tester light should flash when handle is released. Replace blasting machine if machine does not spring back to normal or tester light does not flash, or both.

FOLLOW ON PROCEDURES:

None

REFERENCES:

Drawing No. XM66173

TIME:

12 Minutes

***TASK 2.16.5.5 REPLACE BLASTING MACHINE**

PARTS:	Blasting machine assembly (XM66173) Bracket (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Socket, socket wrench, 3/8 inch square drive, 5/16 inch Extension, socket wrench, 3/8 inch square drive, 6 inch Wrench, torque, 0 to 200 inch pounds Handle, socket wrench, ratchet, 3/8 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Disconnect and remove electrical plug.
2. Disconnect and remove two screws and washers using 7/16 inch socket and handle.
3. Take out blasting machine and bracket.
4. Disconnect and remove screw and washer from bracket using 5/16 inch socket, extension, and handle.
5. Disconnect nut using 7/16 inch socket and handle and take out wire lug and nut.
6. Turn in old blasting machine and bracket.
7. Turn in blasting machine.
8. Inspect bracket.
9. If bent or broken, turn in and replace parts.
10. Put blasting machine through opening in bracket.
11. Put bottom stud of blasting machine in slot.
12. Put hook over top stud.
13. Screw in and tighten nut using 7/16 inch socket and handle.
14. Torque nut between 24 and 30 inch pounds (3 to 4 newton meters) using torque wrench.
15. Put screw with washer through wire lug and screw in and tighten using 5/16 inch socket, extension, and handle.
16. Torque screw between 27 and 32 inch pounds (3 to 4 newton meters) using torque wrench.

***TASK 2.16.5.5 REPLACE BLASTING MACHINE (cont'd.)**

17. Put blasting machine and bracket on mount bracket.
18. Screw in and tighten two screws and washers using 7/16 inch socket and handle.
19. Screw in and tighten electrical plug into receptacle.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-20-2-3-2; pp. 5-39 to 5-48.

TIME:

24 Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Turret Venilation Blower Assembly (2.16.6)

PERFORMANCE OUTCOMES:

Mechanic will:

***2.16.6.3 Replace turret vent blower inlet screen (15 minutes)**

MEASUREMENT:

(for each task)

During Training:	Time: Between end of initiating stimuli and completion of task. Accuracy: As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time: Between end of initiating stimuli and completion of task, not to exceed job-time requirements. Accuracy: As indicated by:

Screws holding inlet screen in place torqued between 96 and 120 inch-pounds (12 to 14 newton meters).

***TASK 2.16.6.3 REPLACE TURRET VENT BLOWER INLET SCREEN**

PARTS:	Screen, inlet (XM66740)
TOOLS:	Brush, wire Compressor, air Gun, air Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, torque, 0 to 200 inch pounds
EXPENDABLES:	Oil, lubricating, OE/HDO-30, MIL-L-2104 Solvent, cleaning P-D-680, type 11

PRELIMINARY PROCEDURE:

1. Traverse turret until main gun is over side of tank and inlet screen is accessible.

MECHANIC WILL:

1. Unscrew and remove six screws and washers using socket and handle.
2. Remove screen.
3. Inspect screen for bent, cracked, or broken areas.
4. If damaged, turn in and replace screen.

WARNING: Solvent burns easily. Do not use near open fire.

5. If screen is not damaged, clean with solvent and brush and dry with air gun.
6. Spread thin coat of oil on threads of six screws.
7. Put screen in place and secure with six screws and washers using socket and handle.
8. Torque six screws between 96 and 120 inch pounds (11 to 14 newton meters) using torque wrench.

FOLLOW ON PROCEDURE:

1. Traverse turret until main gun is over front of tank.

REFERENCES:

DEP 9-2350-20-2-3-2; pp. 5-55 to 5-57.

TIME:

15 Minutes

XML 45E TURRET MECHANIC COMPONENT OUTLINE

MODULE:

Turret Electrical System (2.16)

GROSS WT.

3. Azimuth Drive Assembly (2.16.7)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.16.7.1 Adjust MS azimuth drive assembly (12 minutes)

MEASUREMENT:

(For Vol. Last)

1. The training for the period between end of field after stimulus and collection was

2. The training for the period between stimulus and collection was

3. The training for the period between stimulus and collection was

4. The training for the period between stimulus and collection was

5. The training for the period between stimulus and collection was

6. The training for the period between stimulus and collection was

7. The training for the period between stimulus and collection was

8. The training for the period between stimulus and collection was

9. The training for the period between stimulus and collection was

10. The training for the period between stimulus and collection was

1. The following information was obtained from the file of the Bureau of the Federal Bureau of Investigation, Department of Justice, dated 10/10/50, and is being furnished to you for your information:

10. Slack taken out of tape drive.

... roll of paper smoothly and rollers turn easily.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Commander's Power Control Unit Assembly (2.16.8)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.16.8.1 Replace Commander's power control unit. (27 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
 Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

Use of Training Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
 Accuracy - As indicated by:

Task 2.16.8.1 a. Plug 1110500 attached to receptacle plug 11 on power control unit.

***TASK 2.16.8.1 REPLACE COMMANDER'S POWER CONTROL UNIT**

PARTS:	Washer, lock, 2 ea. (NPN) (MS35333-)
	Washer, star, 8 ea. (NPN)
	Power control unit (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch
	Socket, socket wrench, 3/8 inch square drive, 9/16 inch
	Extension, socket wrench, 3/8 inch square drive, 10-inch
	Handle, socket wrench, ratchet, 3/8 inch square drive
DEPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WELD:

1. Remove two screws and lockwashers on commander's power control unit using 7/16 inch socket, extension, and handle.
2. Remove four screws and lockwashers.
3. Remove four screws, starwashers, and washers from power control unit using 7/16 inch socket, extension, and handle.
4. Remove power control unit from receptacle on commander's power control unit.
5. Remove power control unit from receptacle on commander's power control unit.
6. Remove four screws, starwashers, and washers from power control unit using 9/16 inch socket, extension, and handle.
7. Remove power control unit from receptacle on commander's power control unit.
8. Remove power control unit from receptacle on commander's power control unit.
9. Remove power control unit from receptacle on commander's power control unit.
10. Remove power control unit from receptacle on commander's power control unit.
11. Remove power control unit from receptacle on commander's power control unit.
12. Remove power control unit from receptacle on commander's power control unit.

*TASK 2.16.8.1 REPLACE COMMANDER'S POWER CONTROL UNIT (cont'd.)

13. Screw in and tighten plug 1W105P3 to receptable plug J1 on power control unit.
14. Slide bracket back in place.
15. Screw in four screws, new starwashers and washers using 7/16 inch socket, extension, and handle.
16. Put commander's storage box in place.
17. Secure with two screws and new lockwashers using 9/16 inch socket, extension, and handle.

FOLLOW ON PROCEDURES.

None

REFERENCES:

DEP 3-2350-255-20-2-3-2; pp. 5-79 to 5-81

TIME:

Minutes

**XM1 45E TURRET MECHANIC
COMPONENT OUTLINE**

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Electrical Harness (2.16.9)

PERFORMANCE OUTCOMES:

Mechanic will:

- #2.16.9.1 Replace electrical harnesses (general instructions). (15 minutes)
- 2.16.9.3 Replace electrical harness 1W101. (24 minutes)
- 2.16.9.22 Replace electrical harness 1W204. (18 minutes)
- 2.16.9.34 Replace electrical harness 1W305. (12 minutes)
- 2.16.9.43 Replace electrical harness 1@314. (15 minutes)

MEASUREMENT:

(for each task)

During Training:
Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:
Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

Task 2.16.9.1	a. Electrical receptacle removed and installed.
	b. Electrical harness removed and installed.
	c. Tie-wrap removed and installed.
	d. Cable channel cover removed and installed.

Task 2.16.9.3	a. Plug 1W101P2 to networks box J17.
	b. Plug 1W101P5 to fire sensor 3.
	c. Receptacle 1W101 J2 to bracket.
	d. Plug 1W308P1 to receptacle 1W101J2.
	e. Plug 1W101P4 to fire sensor 2.
	f. Plug 1W101P3 to fire sensor 1.

XMI 45E TURRET MECHANIC (Cont'd.)
COMPONENT OUTLINE

- g. Receptacle 1W101J1 to bracket.
- h. Plug 1W305P1 to receptacle 1W101 J1.
- i. Plug 1W101P1 to slipring J8.
- j. Hull distribution box CB4 set to ON.
- k. Turret electrical system test is GO.

- Task 2.16.9.22
- a. Plug 1W204 P3 to cant unit.
 - b. Plug 1W204 P2 to laser rangefinder J2.
 - c. Plug 1W204 P4 to receptacle 1W205 J1.
 - d. Plug 1W204 P1 to computer electronics unit J3.
 - e. Hull distribution box CB4 to ON.
 - f. Fire control system test is GO.

- Task 2.16.9.34
- a. Plug 1W305 P2 to Commander's intercom control J901.
 - b. Plug 1W305 P1 to receptacle 1W101J1.
 - c. Hull distribution box CB4 to ON.
 - d. Communications system test is GO.

- Task 2.16.9.43
- a. Receptacle 1W314 J1 to bulkhead.
 - b. Plug 1W304 P1 to 1W314J1.
 - c. Hull distribution box to ON.
 - d. Communications system test is GO.

#TASK 2.16.9.1 REPLACE ELECTRICAL HARNESSSES (GENERAL INSTRUCTIONS)

PARTS:	Washer, lock (as required) (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive (length as required) Pliers, diagonal cutting Pliers, slip joint (common) Pliers, slip joint with plastic jaw inserts Wrench, open end (size as required) Brush, adhesive
EXPENDABLES:	Tie wraps (as required) Solvent, cleaning, P-D-680, Type 1E

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

WARNING. Solvent burns easily. Do not use near open fire.
--

1. Clean electrical receptacles, cables, plugs, and ground points using solvent and brush.
2. Check receptacles, cables, and plugs for loose, pushed in, bent, or broken pins.
3. If damaged, turn in part to direct support for repair.
4. Check ground point for cracks, looseness, or broken lugs.
5. If damaged, turn in to direct support for repair.

Remove Electrical Receptacle from Bracket:

6. Unscrew and remove plug from receptacle in bracket.
(Use plastic insert pliers if plug cannot be loosened by hand.)
7. Unscrew and remove jam nut from receptacle in bracket using open end wrench.
8. Remove receptacle from bracket.

***TASK 2.16.9.1 REPLACE ELECTRICAL HARNESSES (GENERAL INSTRUCTIONS) (Cont'd.)**

Install:

9. Put receptacle in bracket.
10. Put jam nut on receptacle and bracket.
11. Screw in and tighten jam nut on bracket using open end wrench.
12. Screw in and tighten plug.

Remove Electrical Harness from Cable Clamps and Straps:

NOTE A: Cable clamps are loops of metal strap held in place with one screw. Cable straps are metal strips held in place with two screws.

13. Unscrew and remove screw(s), lockwasher(s), and washer(s) using 7/16 inch socket and handle.
14. Discard lockwashers.
15. Remove cable from clamp or strap.
16. Put clamp or strap in place on turret with screw(s), new lockwasher(s), and washer(s). (Do not tighten.)
17. Unscrew and remove screw(s), lockwasher(s), and washer(s) from clamp or strap.
18. Insert cable in clamp or strap.
19. Screw in and tighten screw(s), lockwasher(s), and washer(s) using 7/16 inch socket and handle.

Remove Tie-wrap:

20. Cut tie-wrap with diagonal pliers.
21. Remove and discard tie-wrap.

Install:

22. Wrap new tie-wrap around harness bundle with ribbed side facing in.
23. Put tip of tie-wrap through opening and pull tight with common pliers.
24. Cut off loose end of tie-wrap leaving 1/2 inch using diagonal pliers.

Remove Cable Channel Cover:

25. Unscrew and remove all screws and washers using 9/16 inch socket and handle. (Use socket extension if needed.)
26. Remove channel cover and set aside.

#TASK 2.16.9.1 REPLACE ELECTRICAL HARNESSSES (GENERAL INSTRUCTIONS) (Cont'd.)

Install:

27. Place all harnesses into channel.
28. Place channel cover on channel so holes line up with holes in channel.
29. Screw in and tighten screws and washers using 9/16 inch socket and handle. (Use socket extension if needed.)

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 5-83, 86-93.

TIME:

15 Minutes

TASK 2.16.9.3 REPLACE ELECTRICAL HARNESS 1W101

PARTS:	Washer, lock Harness assembly (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive (length as required) Pliers, diagonal cutting Pliers, slip joint (common) Wrench, open end Pliers, slip joint with plastic jaw inserts Brush, adhesive
EXPENDABLES:	Tie wraps

PRELIMINARY PROCEDURES:

1. Set hull distribution box CB4 to OFF.
2. Remove slipring cover (see Task 2.15.15.1).
3. Remove three-round ammunition rack.
4. Remove cable channel cover (see Task 2.16.9.1, steps 25 and 26).
5. Remove turret networks box guard (see Task 2.16.3.7).

MECHANIC WILL:

1. Unscrew and remove 14 screws, washers, and lockwashers from 10 clamps and 2 straps (see Task 2.16.9.1, steps 13 and 15).
2. Unscrew and remove plug 1W101 P1 from slipring J8.
3. Unscrew and remove plug 1W305 P1 from receptacle 1W101 J1.
4. Unscrew and remove receptacle 1W101 J1 from bracket.
5. Unscrew and remove plug 1W101 P3 from fire sensor number 1.
6. Unscrew and remove plug 1W101 P4 from fire sensor number 2.
7. Unscrew and remove plug 1W308 P1 from receptacle 1W101 J2.
8. Unscrew and remove receptacle 1W101 J2 from bracket.
9. Unscrew and remove plug 1W101 P5 from fire sensor number 3.
10. Unscrew and remove plug 1W101 P2 from networks box J11.

TASK 2.16.9.3 REPLACE ELECTRICAL HARNESS 1W101 (Cont'd.)

11. Remove and turn in harness.
12. Clean and inspect electrical receptacles, cables and ground points (see Task 2.16.9.1, steps 1-5).
13. To install harness, reverse the removal procedure.

FOLLOW ON PROCEDURES:

1. Install turret networks box guard (see Task 2.16.3.7).
2. Install cable channel cover (see Task 2.16.9.1).
3. Install three-round ammunition rack.
4. Install slipring cover (see Task 2.15.15.1).
5. Set hull distribution box CB4 to ON.
6. Test turret electrical system.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 5-95 and 96.

TIME:

24 Minutes

TASK 2.16.9.22 REPLACE ELECTRICAL HARNESS 1W204

PARTS:	Washer, lock Harness assembly (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive (length as required) Pliers, diagonal cutting Pliers, slip joint (common) Pliers, slip joint with plastic jaw inserts Wrench, open end Brush, adhesive
EXPENDABLES:	Tie wraps

PRELIMINARY PROCEDURES:

1. Set hull distribution box CB4 to OFF.
2. Remove cable channel cover (see Task 2.16.9.1, steps 25 and 26).

MECHANIC WILL:

1. Remove two clamps (see Task 2.16.9.1, steps 13 and 15).
2. Unscrew and remove plug 1W204 P1 from computer electronics unit J3.
3. Unscrew and remove plug 1W204 P4 from receptacle 1W205 J1.
4. Unscrew and remove plug 1W204 P2 from laser rangefinder J2.
5. Unscrew and remove plug 1W204 P3 from cant unit.
6. Remove and turn in harness.
7. Clean and inspect electrical receptacles, cables, and ground points (see Task 2.16.9.1, steps 1-5).
8. To install new harness, reverse removal procedure.

FOLLOW ON PROCEDURES:

1. Install cable channel cover (see Task 2.16.9.1, steps 27-29).
2. Set hull distribution box CB4 to ON.
3. Test fire control system.

REFERENCES:

DEF 9-2350-255-20-2-3-1, pp. 5-120.

TIME:

18 Minutes

TASK 2.16.9.34 REPLACE ELECTRICAL HARNESS 1W305

PARTS:	Washer, lock Cable assembly (NPN)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive (length as required) Pliers, diagonal cutting Pliers, slip joint (common) Pliers, slip joint with plastic jaw inserts Wrench, open end Brush, adhesive

PRELIMINARY PROCEDURE:

1. Set hull distribution box CB4 to OFF.

MECHANIC WILL:

1. Unscrew and remove plug 1W305 P1 from receptacle 1W101 J1.
2. Unscrew and remove plug 1W305 P2 from commanders intercom control J901.
3. Remove and turn in harness.
4. Clean and inspect electrical receptables, cables, and ground points. (See Task 2.16.9.1., Steps 1-5)
5. To install new harness, reverse removal procedure.

FOLLOW ON PROCEDURES:

1. Set hull distribution box CB4 to ON.
2. Test communications system.

REFERENCES:

DEP 9-2350-255-20-2-3-2.

TIME:

12 Minutes

TASK 2.16.9.43 REPLACE ELECTRICAL HARNESS 1W314

PARTS:	Washer, lock
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 Socket, socket wrench, 3/8 inch square drive, 9/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Pliers, diagonal cutting Pliers, slip joint (common) Pliers, slip joint with plastic jaw inserts Wrench, open end Brush, adhesive Extension, socket wrench, 3/8 square drive (length as required)
EXPENDABLES:	Tie wraps

PRELIMINARY PROCEDURES:

1. Set hull distribution box CB4 to OFF.
2. Remove radio antenna mount (see Task 2.15.13.1, steps 1-6).
3. Remove turret vent blower.

MECHANIC WILL:

1. Unscrew and remove plug 1W304 P1 from 1W314 J1.
2. Unscrew and remove receptacle 1W314 J1 from bulkhead.
3. Remove and turn in harness.
4. Clean and inspect electrical receptacles, cables, and ground points (see Task 2.16.9.1, steps 1-5).
5. To install new harness, reverse removal.

FOLLOW ON PROCEDURES:

1. Install turret vent blower.
2. Install radio antenna mount (see Task 2.15.13.1, steps 8-13).
3. Set hull distribution box CB4 to ON.
4. Test communications system.

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 5-141.

TIME:

15 Minutes

XM1 45E TURRET MECHANIC COMPONENT OUTLINE

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Switch Assemblies (2.16.10)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.16.10.1 Replace zero elevation switch assembly (30 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

Task 2.16.10.1 a. Activator bracket pushes in plunger on elevation switch when main gun is levelled.

*TASK 2.16.10.1 REPLACE ZERO ELEVATION SWITCH ASSEMBLY

PARTS:	Washer, lock, 5 ea. (NPN) Switch assembly, zero elevation (NPN)
TOOLS:	Pliers, retaining ring. Screwdriver, flat tip. Wrench, combination, 5/8 inch
EXPENDABLES:	Block, wood

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Manually traverse turret so main gun is over rear deck of tank.
2. Elevate main gun to maximum elevation.
3. Put block of wood between rear deck and gun shield.
4. Unscrew and remove plug from cable receptacle.
5. Pull retaining ring from plunger end using pliers.
6. Unscrew plunger end from switch with dingers.
7. Unscrew and remove screw, terminal end, and lockwasher from activator bracket using screwdriver.
8. Discard lockwasher.
9. Unscrew and remove locknut and key washer from switch using wrench.
10. Remove switch from bracket.
11. Unscrew and remove four screws, washers, lockwashers, and straps using wrench.
12. Discard lockwashers.
13. Turn in defective switch.
14. Slide switch on activator bracket.
15. Put on key washer and tighten locknut on switch using wrench.
16. Put screw and new lockwasher through terminal end into bracket.

***TASK 2.16.10.1 REPLACE ZERO ELEVATION SWITCH ASSEMBLY (cont'd.)**

17. Screw in and tighten screw using wrench.
18. Screw plunger on switch.
19. Put retaining ring on plunger using pliers.
20. Push in and screw on plug to receptacle.
21. Screw in and tighten four screws, washers, and new lockwashers on straps using wrench.
22. Remove block of wood from between rear deck and gun shield.
23. Level main gun.
24. Activator bracket should push in plunger on switch.
25. If it does not, do the following:
 - a. Adjust plunger by removing pin using screwdriver.
 - b. Turn roller guide to right until plunger clicks.
 - c. Screw in and tighten pin using screwdriver.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-2; pp. 5-151 to 5-156.

TIME:

30 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Turret Electrical System (2.16)

COMPONENT:

Turret Domelight (2.16.11)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.16.11.1 Replace domelight rheostat knob (6 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.16.11.1	a. Rheostat knob installed on shaft to rheostat with white dot on knob adjacent to work OFF on lower housing.
	b. Approximately 1/32 in. clearance provided between inner face of knob and housing.

***TASK 2.16.11.1 REPLACE DOMELIGHT RHEOSTAT KNOB**

PARTS:	Knob, Rheostat (X160886) Setscrew, 2 ea. (NPN)
TOOLS:	Key, sockethead screw, 5/64 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Using key wrench loosen two (2) setscrews, securing knob to shaft of rheostat, until knob comes free of shaft.
2. Discard knob and setscrews.
3. Rotate rheostat shaft to the full counterclockwise position.
4. Thread two new setscrews part way into replacement knob.
5. Install knob on shaft to rheostat with white dot on knob adjacent to word "OFF" on lower housing. (Provide approximately 1/32 in. clearance between inner face of knob and housing.)
6. Tighten two setscrews in knob using key wrench.

FOLLOW ON PROCEDURES:

None

REFERENCES:

Drawing No. SM 60870

TIME:

6 Minutes

APPENDIX H
FIRE CONTROL SYSTEM

LESSON PLAN OUTLINE

FIRE CONTROL SYSTEM

A. TRAINING OBJECTIVE

TASK: Each mechanic will meet the MEASUREMENT criteria for during training and end of training for the 25 tasks in the Fire Control System module.

CONDITIONS: As described in the PRELIMINARY and FOLLOW ON PROCEDURES.

STANDARD: See MEASUREMENT for each task.

B. INTERMEDIATE TRAINING OBJECTIVE

(None)

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given:
2. Training location:
3. Who will be trained:
4. Principal and assistant instructors:
5. Equipment and materials: As described for each task.

D. SEQUENCE

1. State training objective and reason for learning the tasks.
2. Demonstrate or have assistant(s) demonstrate each task.
3. Conduct walk-through/practice session by having mechanics demonstrate each task. Circulate among the students and critique their performance.
4. Test mechanics individually. If a mechanic cannot perform a step of a task, you may show him how to perform the step, and continue the test or have the mechanic go practice or study. Before the mechanic can be signed off on a task, he must perform the test with no prompting.

E. SAFETY INSTRUCTIONS

F. ADDITIONAL COMMENTS AND INFORMATION

The MEASUREMENT requirements for tasks in each component are presented on the cover sheet for the component (Component Outline) rather than as part of the task.

The Measurement part for each task identifies the start and stop points for measuring time and describes how to assess the accuracy of performance. Measurement specifications are presented for two stages of learning. During the first stage, training, time is the principal concern. The mechanic should perform the task faster during successive performances, until at the second stage, the end of training, the performance time meets the on-the-job time requirement. The accuracy requirement during training is simply that the mechanic perform the task exactly as described under Mechanic Will. Measurement at the end of training, will focus on products of successful task performance whenever such a focus is practical. A thorough discussion of the measurement issue is in Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement.¹

The procedures described under MECHANIC WILL for each task are derived from Task and Skill Analysis Report, Final, [XM1] for the Tank, Combat, Full Tracked 105-MM Gun. Chrysler Corporation, 1979. There is a possibility that the procedures have changed with design changes in the XM1. The procedures should be updated for the XM1 based on current TMs and actual hands-on verification during the instructor training phase for the OT. Then, during DT, the procedures for each task should be tried out on the training device and the discrepancies in XM1 procedures and device procedures noted. Any changes in the described procedures may require a change in the MEASUREMENT requirement for the task.

Two tasks in this module have one or more maintenance prerequisite tasks which can be taught according to the lesson plan outline for the module. Mechanics must be taught these prerequisite tasks before proceeding with the module. The prerequisite tasks and their corresponding module tasks are:

<u>Prerequisite Task</u>	<u>Module Task Number</u>
Remove ballistic shield	2.14.1.20
Remove LRF	
Remove GPS browpad	
Remove image control unit	2.14.18.6

¹Boldovici, J.A. Analyzing Tank Gunnery Engagements for Simulator-Based Process Measurement. Fort Knox, Kentucky: Human Resources Research Organization (HumRRO), Final Report 78-4, 1978.

TASK 2.

REPLACE BALLISTIC SHIELD COVER

PARTS:	Blocks, wood, 4x4x24 inches (two required)
TOOLS:	Handle, socket wrench, hinged, 1/2-inch square drive Hoist, 1000-pounds capacity Socket, socket wrench, 1/2-inch square drive, 7/16- inch Socket, socket wrench, 1/2-inch square drive, 1-1/8-inch Wrench, open end, 7/16-inch Bolt, eye-shoulder, MS51937-7 (two required) (part of Kit, lifting, CWS, 12284836) Sling, lifting, Gunner's Primary Sight, 12282460
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None.

MECHANIC WILL:

NOTE A: To remove cover, do steps 1 through 13.

NOTE B: Three soldiers are required to complete task: the mechanic removes the cover; soldier A assists the mechanic; and, soldier B operates the hoist.

1. Have soldier B move hoist next to tank.
2. Screw two eyebolts into slanting backside of cover as far as they go.

3. Hook sling to hoist and eye bolts.

NOTE C: Do not let anything touch the Gunner's Primary Sight (GPS) lenses.

4. Unscrew and take off nine nuts holding the cover to the turret deck with 1-1/8 inch socket and handle.
5. In the gunner's station, open the left ballistic door by grasping the left ballistic door handle, squeezing the lever on top and turning handle clockwise.
6. In the gunner's station, open the right ballistic door by grasping the right ballistic door handle, squeezing the lever on top and turning the handle counterclockwise.
7. Unscrew and take out screw and nut on ballistic door deal with 7/16-inch socket, handle, and wrench.
8. In the gunner's station, close the right ballistic door by grasping the right handle, squeezing the lever and turning clockwise.

TASK 2:

REPLACE BALLISTIC SHIELD COVER (cont'd.)

9. In the gunner's station, close the left ballistic door by grasping the left handle, squeezing the lever and turning counterclockwise.

NOTE D: Steps 10 through 12 must be done together

10. Have soldier B operate hoist to lift the cover from turret deck and move to wood blocks.
11. With soldier A, guide cover and set on wooden blocks.
12. Unhook sling from cover.
13. Look at cover for bends or cracks. If bad, unscrew and take out two eye bolts and turn in cover, If okay, set aside for later use.

NOTE E: To install new cover, do steps 14 through 23. If cover is not new, do steps 15 through 23.

14. Screw two eyebolts into slanting backside of cover as far as they go and hook sling to eyebolts.
15. Have soldier B operate hoist to lift cover from wooden blocks to turret deck.
16. With Soldier A, guide cover in place on nine studs on turret deck.
17. Unhook sling from eyebolts.
18. Have soldier B move hoist away from tank.
19. Open ballistic doors (see steps 5 and 6).
20. Put screw in ballistic door seal. Place nut on screw and tighten nut with 7/16-inch socket, handle, and wrench.
21. Close ballistic doors (see Steps 8 and 9).
22. Place nuts on nine studs and tighten with 1-1/8 inch socket and handle.
23. Unscrew and take out two eyebolts by hand.

FOLLOW ON PROCEDURES:

None.

REFERENCES:

TM 9-2450-255-20-2-3-2; pp. 125-9.

TIME:

Minutes.

TASK 2.14.17.1 REPLACE LASER RANGEFINDER

PARTS:	Laser rangefinder (XM63009) Pin, cotter (MS24665-317) Washer, lock (NPII)
TOOLS:	Brush, paint, oval Handle, socket wrench, ratchet, 1/2 inch square drive Socket, socket wrench, 1/2 inch square drive, 3/4 inch Wrench, combination, 3/4 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Remove cotter pin and straight pin securing upper end of GAS support arm. Discard cotter pin.
2. Carefully lower support arm to resting position.
NOTE A: The laser rangefinder is a delicate piece of equipment. Care must be used in handling and shipping.
3. Unscrew and remove three electrical connectors from rangefinder.
4. Remove three protective covers from new rangefinder and install them on old rangefinder.
5. Unscrew and remove three screws and lockwashers securing rangefinder to GPS using socket, handle, and combination wrench.
6. Discard the used lockwashers.
7. Carefully lift out rangefinder.
8. Remove lens cover from new rangefinder and install on old rangefinder.
9. Turn in rangefinder.
10. Look for dust on lens of new rangefinder. Brush dust off lens using brush.
11. Ensure that packing is on rangefinder.
12. Position new rangefinder in place by aligning it with two pins on GPS.
13. Screw in and tighten three screws and new lockwashers to secure rangefinder to GPS, using socket, handle, and combination wrench.

TASK 2.14.17.1 REPLACE LASER RANGEFINDER (cont'd.)

13. Screw in and tighten the electrical connectors on receptacles.
14. Put GAS support arm in place and secure with straight pin and new cotter pin.

FOLLOW ON PROCEDURES:

1. Boresight GPS
2. Test laser rangefinder

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-203 and 3-204.

TIME:

36 minutes.

TASK 2.14.1.11. REPLACE GPS HEADREST

PARTS:	Headrest (XM63204) Washer, lock (MS35338-139)
TOOLS:	Extension, socket wrench, 3/8 inch square drive, 6 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None.

MECHANIC WILL:

1. Turn the headrest securing handle to left by hand.
2. Pull headrest out of mounting bracket.
3. Holding the headrest in hand, unscrew and remove two screws and lockwashers from adjustment bracket, using socket, extension, and handle.
4. Discard the old headrest and lockwashers.
5. Align adjustment bracket and new headrest.
6. Screw in and tighten two screws and new lockwashers with socket, extension, and handle.
7. Put adjustment bracket into mounting bracket and tighten the headrest securing handle by hand.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-9, 3-10, and 3-14.

TIME:

6 Minutes

TASK 3. REPLACE IMAGE CONTROL UNIT

PARTS:	Cap, protective, image window Caps and plugs, protective (MIL-C-5501) Tags, identification Lockwasher
TOOLS:	Extension, socket wrench, 3/8 inch square drive, 5-inch Handle, socket wrench, ratchet, 3/8 inch square drive Pliers, slip joint, conduit style with plastic jaw inserts Screwdriver, cross tip Socket, socket wrench 3/8 inch square drive, 7/16 inch Tee wrench, 5/32 hex, 9-inch (12285473)
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Park tank.
2. Set parking brake.
3. Set VEHICLE MASTER POWER switch to OFF.
4. Set transmission control to N.
5. Remove computer control panel (See TM 9-2350-255-20-2-3-2, paragraph 7-15, Task 1).

MECHANIC WILL:

NOTE A: To remove the Image Control Unit,
do steps 1 through 10.

1. Unscrew and take out screw, lockwasher, and washer holding ground lug to gunner's primary sight with screwdriver.
2. Get rid of lockwasher.
3. Tag electrical connectors.
4. Unscrew and take off two electrical connectors from Image Control Unit (ICU) with pliers.
5. Unscrew three bottom captive screws with socket, extension, and handle.
6. Hold in the ICU with one hand, unscrew the three top captive screws, using the tee wrench.
7. Pull ICU straight out and about 3 inches away from laser rangefinder.

TASK 3. REPLACE IMAGE CONTROL UNIT (cont'd)

8. Tip front of ICU down and pull away from gunner's primary sight.
 9. Put protective cap on image window.
 10. Look at ICU for cracks or breaks; if bad, turn in; if okay, set aside for later use.
- NOTE B: To install the ICU, do steps 11 through 17.
11. Take off protective cap from image window on ICU.
- NOTE C: Put in locator pin first so window rim will not be nicked or blurred.
12. Put locator pin into hole in gunner's primary sight and lining up image window rim with recess, push ICU straight in.
 13. Holding the ICU in place with one hand, screw in and tighten three top captive screws, using the tee wrench.
 14. Screw in and tighten three bottom captive screws with socket, extension, and handle.
 15. Screw in and tighten two electrical connectors with pliers.
 16. Remove tags from connectors.
 17. Aligning ground lug with hole in gunner's primary sight, screw in and tighten screw, new lockwasher, and washer with screwdriver.

FOLLOW ON PROCEDURES:

1. Install computer control panel (See TM 9-2350-255-20-2-3-2, paragraph 7-15, Task 4).
2. Do HIS built-in test (See TM 9-2350-255-10)

REFERENCE:

TM 9-2350-255-20-2-3-2; pp. 7-245 to 7-248.

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Computer Control Panel (2.14.11)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.14.11.3 Replace computer control panel (CCP) (48 minutes)

MEASUREMENT:

(for each task)

	Time - Between end of initiating stimuli and completion of task.
During Training:	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
End of Training:	Accuracy - As indicated by:

Task 2.14.11.3	a. Screws holding upper wall mount torqued between 96 and 120 inch-pounds (11 to 14 newton meters).
	b. Jumper assembly connected to control panel.
	c. Electrical cable connected to receptacle on CCP.

*TASK 2.14.11.3 REPLACE COMPUTER CONTROL PANEL (CCP)

PARTS:	Computer Control Panel (including mounts and attaching hardware) (XM67193) Washer, coned, 2 ea. (XM65408-1) Nut, self-locking, 2 ea. (MS519431)
TOOLS:	Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 7/16 inch Wrench, open end, 7/16 inch Wrench, open end, 11/32 inch (two required) Wrench, torque, 0 to 200 inch pounds
EXPENDABLES:	Oil, lubricating, OE/HDO-30, MIL-L-2104

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Lift handle up and open panel door.
2. Set power switch to OFF and close door.
3. Disconnect electrical cable connector from receptacle on CCP.
4. Remove jumper assembly.
5. Hold panel in place and unscrew and remove four screws and washers securing panel to four panel mounts using socket, extension, and handle.
6. Remove panel from panel mounts.
NOTE A: Panel mounts and wall mounts are part of CCP and must be turned in with panel.
7. Unscrew and remove four screws, nuts, lockwashers, and washers from each of four panel mounts using two 11/32 inch wrenches.
8. Discard screws, nuts, and lockwashers.
9. Remove four panel mounts from wall mounts.
10. Unscrew and remove two screws and coned washers from upper wall mounts using socket and handle.
11. Discard coned washers.
12. Remove upper wall mounts.

*TASK 2.14.11.3 REPLACE COMPUTER CONTROL PANEL (CCP) (Cont'd.)

13. Unscrew and remove two screws and locknuts from lower wall mounts using socket, extension, handle, and 7/16 inch wrench.
14. Discard locknuts.
15. Remove lower wall mounts.
16. Turn in panel, panel mounts, and wall mounts.
17. Spread thin coat of oil on four screws used for wall mounts.
18. Screw in two screws and new coned washers into new upper wall mounts using socket, extension, and handle.
19. Torque screws between 96 and 120 inch-pounds (11 to 14 newton meters) using torque wrench.
20. Screw in and tighten two screws and new lockwashers into new lower wall mounts using extension, handle, and 7/16 inch wrench.
21. Put four new panel mounts on wall mounts.
22. Screw in and tighten four new screws, new nuts, new lockwashers, and washers on each panel mount using two 11/32 inch wrenches.
23. Spread thin coat of oil on four screws used to secure panel to panel mounts.
24. Hold panel in place and secure with four screws and washers using socket, extension, and handle.
25. Connect jumper assembly.
26. Connect electrical cable connector to receptacle on CCP.

FOLLOW ON PROCEDURE:

1. Operate control panel.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-125 to 3-132.

TIME:

48 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Commander's GPS Extension Assembly (2.14.2)

PERFORMANCE OUTCOMES:

Mechanic will:

- * 2.14.2.4 Replace Commander's GPS extension (1 Hour)

MEASUREMENT:

(for each task)

During Training:

- Time - Between end of initiating stimuli and completion of task.
- Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

- Time - Between end of initiating stimuli and completion of task, not to exceed job-requirements.
- Accuracy - As indicated by:

- | | |
|---------------|---|
| Task 2.14.2.4 | a. Screws holding GPS extension in place at mounting bracket torqued between 70 and 80 foot-pounds (95 to 113 newton meters). |
| | b. Headrest assembly secured to GPS extension. |

*TASK 2.14.2.4 REPLACE COMMANDER'S GPS EXTENSION

PARTS:	Washers, lock, 10 ea. (MS35338-141) Pin, cotter, 1 ea. (MS24665-423) Bracket, 1 ea. (XM63129) Commander's Gunner's Primary Sight Extension Assembly (XM63003)
TOOLS:	Wrench, torque, 0 to 175 foot-pounds Key, socket headscrew, 5/32 inch Socket, socket wrench, 1/2 inch square drive, 3/4 inch Handle, socket wrench, ratchet, 1/2 inch square drive
EXPENDABLES:	Grease, GAA (auto-MIL-10924)

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Remove three screws and lockwashers holding headrest assembly to commander's GPS extension using key.
2. Discard lockwashers.
3. Remove and set aside headrest assembly.
4. Using key, unscrew and remove six screws and lockwashers securing commander's GPS extension to tank.
5. Discard lockwashers.
6. Remove cotter pin from straight pin at mounting bracket located above eyepiece.
7. Discard cotter pin.
8. Hold sight extension and remove straight pin by hand.
9. Turn in sight extension.
10. Inspect mounting bracket for cracks and loose screws.
NOTE A: If bracket is not loose or cracked, go to step 13. If bracket is loose or cracked, go to step 11.
11. If screws are loose, torque screws using torque wrench between 70 and 84 foot-pounds (95 to 114 newton meters).
12. If bracket is cracked, do the following:
 - a. Unscrew and remove four screws and lockwashers using socket and handle.
 - b. Discard lockwashers.
 - c. Turn in bracket.

* TASK 2.14.2.4 REPLACE COMMANDER'S GPS EXTENSION (Cont'd.)

- d. Spread light coat of grease on four screw threads.
 - e. Hold new bracket in place.
 - f. Screw in four screws and new lockwashers finger tight.
- 13. Hold new sight extension in place and push in straight pin by hand.
 - 14. Install new cotter pin in straight pin hole.
 - 15. Using key, screw in and tighten six screws and new lockwashers.
 - 16. Torque four screws at mounting bracket between 70 and 80 foot-pounds (95 to 113 newton meters) using torque wrench.
 - 17. Hold headrest assembly and align holes in headrest mounting bracket with holes in commander's GPS extension.
 - 18. Using key, install three screws and new lockwashers, securing headrest assembly to commander's GPS extension.

FOLLOW ON PROCEDURE:

- 1. Purge and charge commander's GPS extension assembly.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-31 to 3-34.

TIME:

1 Hour

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Gunner's Primary Sight Assembly (2.14.1)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.14.1.17 Purge and charge GPS. (18 minutes)
- 2.14.1.18 Replace GPS Filter/Clear/Shutter switch. (1 hour, 12 minutes)
- 2.14.1.19 Adjust GPS day sight counter rotation scaling. (51 minutes)
- *2.14.1.20 Replace GPS (2 hours, 42 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

Task 2.14.1.17	a. Eight pounds per square inch (nitrogen) registers in GPS. b. GPS valve core cap in place.
----------------	---

Task 2.14.1.18	a. Filter/Clear/Shutter switch operates in each position.
----------------	---

Task 2.14.1.19	a. Trimpot labelled TCR on GPS upper panel adjusted so that signal on waveform A of strip recorder equals 2.81 volts during constant rate portion of computer test. b. Computer self-test passes azimuth rate test (number 4 in failure display).
----------------	--

XMI 45E TURRET MECHANIC (Cont'd.)
COMPONENT OUTLINE

- | | |
|----------------|--|
| Task 2.14.1.20 | a. Screws holding GPS in place torqued between 360 and 432 inch-pounds (41 to 49 newton meters). |
| | b. Connectors installed on GPS. |
| | c. Headrest assembly installed on mounting bracket. |

* TASK 2.14.1.17 PURGE AND CHARGE GPS

PARTS:	None
TOOLS:	Kit, purging, fire control 4931-00-065-1110 Wrench, open end, 3/8 inch Wrench, adjustable, 12 inch Cylinder, gas, nitrogen
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Position main gun over front of tank.

MECHANIC WILL:

1. Place purging kit and gas cylinder on ground on left side of tank.
2. Unscrew cylinder valve until gas can be heard.
3. Tighten valve by hand.
4. Screw on and tighten adapter using adjustable wrench.
5. Fully close regulator valve by turning counterclockwise.
6. Unscrew cylinder valve and look for pressure on high pressure gage located closest to cylinder.
7. If pressure is less than 100 pounds per square inch, replace with new cylinder of gas.
8. Enter tank and bring hose through commander's hatch.
9. Unscrew and remove GPS valve core cap using 3/8 inch wrench.
10. Screw on and tighten hose fitting to service valve using adjustable wrench.
11. Open regulator valve by turning clockwise while watching gage.
12. Stop turning valve when 8 pounds per square inch is reached on gage.
13. Listen for gas coming out of relief valve.
14. Close cylinder valve after five minutes.
15. Unscrew and remove hose fitting from service valve using adjustable wrench.
16. Screw on and tighten valve core cap using 3/8 inch wrench.

* TASK 2.14.1.17 PURGE AND CHARGE GPS (Cont'd.)

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-41 to 3-44.

TIME:

18 Minutes

TASK 2.14.1.18 REPLACE GPS FILTER/CLEAR/SHUTTER SWITCH

PARTS:	Switch, Filter/Clear/Shutter (MS 25085-1) Washers, lock, 2 ea. (MS 35338-134)
TOOLS:	Key, sockethead screw, 5/64 inch Soldering iron Screwdriver, flat tip Knife, pocket Pliers, slip joint Screwdriver, cross tip
EXPENDABLES:	Solder, flux cord

PRELIMINARY PROCEDURES:

None

MECHANIC WILK:

1. Remove lower control panel assembly.
2. Remove two cap screws and lockwashers securing Filter/Clear/Shutter switch to sight body using wrench.
3. Discard lockwashers.
4. Cut wires close to switch using knife.
5. Discard switch.
6. Position new switch on shaft and secure with two cap screws and new lockwashers finger tight.
7. Connect and solder wires to switch terminals using soldering iron and solder.
8. Tighten two screws using screwdriver.
9. Install lower control panel.

FOLLOW ON PROCEDURE:

1. Check Filter/Clear/Shutter switch.

REFERENCES:

FIG 3-22-79.

TIME

Four, 12 Minutes

TASK 2.14.1.19 ADJUST GPS DAY SIGHT COUNTER ROTATION SCALING

PARTS:	None
TOOLS:	Screwdriver, cross tip, No. 2 Screwdriver, jewelers Strip recorder, battery powered, with electrical power
EXPENDABLES:	Sealer, Glyptol, EC801

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Screw in and tighten plug of strip recorder cable to receptacle of turret networks box.
2. Put the following turret switches to positions indicated:

Switch Location	Switch Name	Position
Commander's Panel	AUX HYDR POWER	ON
Commander's Panel	TURRET POWER	ON
GPS	FIRE CONTROL MODE	NORMAL
GPS	THERMAL TEST PATTERN	OFF
Computer Control Board	POWER	ON
Loader's Panel	GUN TURRET DRIVE	POWERED
3. Set sensitivity control on strip recorder to "200."
4. Check battery indicator to make sure recorder is operable. [Indicator should read "GOOD." (Strip recorder cable checks the AZ rate to computer signal to the recorder on test pin 85, and checks the return signal on test pin 33.)]
5. Push "50" button. (This will start the recorder.)
6. Unscrew and remove four screws from upper trimpot cover located on GPS upper panel using cross tip screwdriver.
7. Squeeze and hold palm switches on gunner's control handles.
8. With palm switches squeezed, push "TEST" button on computer control panel and observe signal on strip recorder on waveform A.
9. Adjust trimpot labelled TCR on GPS upper panel using screwdriver until signal observed on waveform A shows a constant rate portion of the waveform, which requires rotating several times.
10. When adjustment is complete, counter scale should show azimuth rate test (number 4 in the azimuth display).

TASK 2.14.1.19 ADJUST GPS DAY SIGHT COUNTER ROTATION (Cont'd.)

10. Lock the TCR trimpot by applying sealer when adjustment is complete.
11. Put trimpot cover on and secure with four screws.
12. Tighten using cross tip screwdriver.
13. Push "OFF" button on stop strip recorder.
14. Unscrew and remove plug from receptacle of turret networks box.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-2-1; pp. 3-23 to 3-28.

TIME:

51 Minutes

***TASK 2.14.1.20 REPLACE GPS**

PARTS:	Washers, lock, 12 ea. (MS35338-139) GPS (number unknown)
TOOLS:	Bar, pry Brush, paint Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 9/16 inch Wrecker, 5-ton or equivalent lifting device Wrench, torque, 0 to 600 inch lbs. Eyebolt, MS51937-7 (three required) GPS holding fixture, XM66900 GPS sling, XM65748
EXPENDABLES:	Sealing compound, general purpose, MIL-S-11031 RTV Sealant, MIL-A-46106A, Type I

PRELIMINARY PROCEDURES:

1. Remove commander's GPS extension.
2. Remove GPS cover.

MECHANIC WILL:

NOTE A: This task requires assistance from a 63E10 (Soldier A) and a 63F20 (Soldier B).

1. Turn headrest locking handle to left by hand.
2. Pull headrest assembly out of mounting bracket and set aside.

Soldier B: Position lifting device next to tank with boom over sight.

3. Screw in and tighten three eyebolts by hand.
4. Unscrew and remove twelve screws, washers, and lockwashers from sight using socket, extension, and handle.
5. Discard lockwashers.

Soldier A: Hook sling to boom and eyebolts.

6. Remove 11 connectors from sight.

Soldier B: Operate boom to lift out sight.

7. Guide and direct Soldier B in lifting out sight.
8. Guide sight onto GPS holding fixture.

* TASK 2.14.1.20 REPLACE GPS (Cont'd.)

Soldier A: Unhook sling from sight.

Soldier A: Unscrew and remove three eyebolts from sight. Turn in sight.

Soldier A: Screw three eyebolts into new sight.

Soldier A: Hook sling to three eyebolts on sight.

Soldier B: Operate boom to lift sight.

9. Guide sight into place on guide pins.
10. Unhook sling from eyebolts and remove sling from boom.
Soldier A: Guide lifting device away from tank.
Soldier B: Lifting device can be moved from tank.
11. Unscrew and remove three eyebolts from sight.
12. Using pry bar, line up holes with top of turret.

WARNING: Sealing compounds burn easily. Do not use near open fire. Sealing may give off harmful vapor. Use in well ventilated area.

13. Spread thin coat of sealing compound on 12 screws using brush.
14. Screw in and tighten 12 screws, new lockwashers, and washers using socket, extension, and handle.
15. Torque screws between 360 and 432 inch-pounds (41 to 49 newton meters).
16. Apply a bead of RTV sealant to turret recess lip and gunner's primary sight flange.
17. Install 11 connectors onto sight.
18. Install headrest assembly on mounting bracket.
19. Secure by turning headrest locking handle to right by hand.

FOLLOW ON PROCEDURES:

1. Install GPS cable.
2. Install commander's GPS extension.
3. Connect to (GPS cable).
4. Connect to (GPS cable).
5. Connect to (GPS cable).

*TASK 2.14.1.20 REPLACE GPS (Cont'd.)

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-18 to 3-22.

TIME:

2 Hours, 42 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Electronics Rack Assembly (2.14.3)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.14.3.1 Replace electronics rack jumper assembly (computer electronic unit, thermal electronics unit, LOS electronics box). (3 minutes)
- *2.14.3.4 Replace electronics rack shock mounts (floor). (12 minutes)

MEASUREMENT:

(For each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.14.3.1	a. Jumper assemblies installed on each unit or box with one lockwasher on each side of terminal.
---------------	--

Task 2.14.3.4	a. Rack secured to shock mounts.
	b. Angle bracket secured to turret.

***TASK 2.14.3.1 REPLACE ELECTRONICS RACK JUMPER ASSEMBLY (COMPUTER ELECTRONIC UNIT, THERMAL ELECTRONICS UNIT, LOS ELECTRONICS BOX)**

PARTS:	Jumper assembly (6 inch, 2 each) (MS25083-2006) Jumper Assembly (10 inch) (MS25083-2CC10) Washers, lock, 6 ea. (MS35333-40)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive
EXPENDABLES:	None

FOLLOW ON PROCEDURES:

None

MECHANIC WILL:

NOTE A: These procedures apply to jumper assemblies to the computer electronics unit (10 inch), the thermal electronics unit (6 inch), and the LOS electronics box (6 inch).

1. Unscrew and remove screw, two lockwashers, and jumper assembly from unit using socket, extension, and handle.
2. Discard jumper assembly and lockwashers.
3. Install new jumper assembly on unit using one new lockwasher on each side of terminal.
4. Secure with screw using socket, extension, and handle.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEF 9-2450-255-COP-2; pp. 142 and 143.

TIME:

3 Minutes

* TASK 2.14.3.4 REPLACE ELECTRONICS RACK SHOCK MOUNTS (FLOOR)

PARTS:	Mount, shock, 2 ea. (X162763) Washers, lock, 11 ea. (MS35333-40)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Remove computer electronics unit.
2. Remove gun turret drive electronics box.
3. Remove LOS electronic box.
4. Remove thermal electronics unit.

MECHANIC WILL:

1. Unscrew and remove three screws and lockwashers securing angle bracket to turret using socket, extension, and handle.
2. Discard lockwashers.
3. Unscrew and remove two screws and lockwashers from left and right sides of rack securing rack to two shock mounts using socket, extension, and handle.
4. Discard lockwashers.
5. Pull out rack and set aside.
6. Unscrew and remove two screws and lockwashers from each shock mount to turret floor using socket, extension, and handle.
7. Discard shock mounts and lockwashers.
8. Put two new shock mounts in place.
9. Screw in and tighten two screws and new lockwashers to each shock mount using socket, extension, and handle.
10. Put rack in place.
11. Screw in and tighten two screws and new lockwashers on left and right sides of rack to secure rack to shock mounts using socket, extension, and handle.
12. Screw in and tighten three screws and new lockwashers to angle bracket to turret using socket, extension, and handle.

* TASK 2.14.3.4 REPLACE ELECTRONICS RACK SHOCK MOUNTS (FLOOR)

FOLLOW ON PROCEDURES:

1. Install thermal electronics unit.
2. Install LOS electronics box.
3. Install gun turret drive electronics.
4. Install computer electronics unit.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-45 to 3-47.

DEP 9-2350-255-20P-2; pp. 142 and 143.

TIME:

12 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

LOS Electronics Unit (2.14.4)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.14.4.1 Replace LOS electronics unit (30 minutes)

MEASUREMENT:

(for each task)

	Time - Between end of initiating stimuli and completion of task.
During Training:	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
End of Training:	Accuracy - As indicated by:

- | | |
|---------------|---|
| Task 2.14.4.1 | a. Screw holding jumper cable to lower left hole in LOS unit torqued between 48 to 60 inch-pounds (5 to 6 newton meters). |
| | b. Seven remaining screws holding LOS unit to rack torqued between 96 to 120 inch-pounds (11 to 13 newton meters). |
| | c. Plugs screwed into LOS unit. |
| | d. Five cables attached to TIS electronics unit. |
| | e. Four cables attached to computer electronics unit. |

*TASK 2.14.4.1 REPLACE LOS ELECTRONICS UNIT

PARTS:	Washer, lock, 2 ea. LOS electronic unit (XM63318)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Extension, socket wrench, 3/8 inch square drive, 6 inch Wrench, torque, 0 to 200 inch-pounds
EXPENDABLES:	Sealing compound, threadlocking, MIL-S-46163

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove two plugs from LOS electronics unit.
2. Unscrew and remove five cables from TIS electronics unit.
3. Unscrew and remove four cables from computer electronics unit.
4. Unscrew and remove lower left screw, two lockwashers, and jumper cable from LOS unit using socket and handle.
5. Discard lockwasher.
6. Unscrew and remove seven remaining screws and washers from LOS unit using socket, extension, and handle.
7. Pull out LOS unit from rack and turn it in.
8. Slide new LOS unit into rack.
9. Spread a thin coat of sealing compound on one screw and set aside.
10. Position jumper cable between two new lockwashers.
11. Secure jumper cable and lockwashers in lower left hole on LOS unit with screw coated with sealing compound using socket and handle.
12. Torque screw between 48 to 60 inch-pounds (5 to 6 newton meters) using torque wrench.
13. Screw in remaining seven screws and washers to LOS unit using socket, extension, and handle.
14. Torque screws between 96 to 120 inch-pounds (11 to 13 newton meters) using torque wrench.
15. Screw two plugs into LOS unit.

*TASK 2.14.4.1 REPLACE LOS ELECTRONICS UNIT (Cont'd.)

16. Screw five cables onto TIS electronics unit.
17. Screw four cables onto computer electronics unit.

FOLLOW ON PROCEDURES:

1. Test LOS unit.
2. Adjust normal mode elevation drift.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-43 to 3-45.

TIME:

30 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

GPS Ballistic Cover, Handle, and Linkage (2.14.7)

PERFORMANCE OUTCOMES:

Mechanic will:

2.14.7.1 Replace GPS ballistic cover door (15 minutes)

MEASUREMENT

(for each task)

During Training:
Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:
Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

- | | |
|---------------|---|
| Task 2.14.7.1 | a. GPS lenses not damaged. |
| | b. Daylight and Thermal ballistic doors open and close. |

TASK 2.14.7.1 REPLACE GPS BALLISTIC COVER DOOR

PARTS:	Door (left) (XM68023) Door (right) (XM68024)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 3/4 inch Handle, socket wrench, ratchet, 3/8 inch square drive Punch, drive pin, tapered, 1/8 inch point Hammer, hand, ball peen Pliers, slip joint
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

NOTE A: The two doors are different in size and shape, but the same procedure is used for both doors.

CAUTION: Do not let anything touch GPS lenses. Do not try to clean them. Lenses may be damaged by such contact.

1. Open ballistic doors.
2. Unscrew and remove two screws from door using socket and handle.
3. Tap out two spring pins securing two straight pins using punch and hammer.
4. Pull out spring pins with pliers.
5. Remove two straight pins.
6. Lift off door and turn in
7. Put new door in place and put in two straight pins.
8. Drive two spring pins into place using hammer.
9. Screw in and tighten two screws using socket and handle.
10. Close ballistic doors.

TASK 2.14.7.1 REPLACE GPS BALLISTIC COVER DOOR (Cont'd.)

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-67 and 3-68.

DEP 9-2350-255-20P-2; pp. 146 and 147.

TIME:

15 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Gunner's Auxiliary Sight Assembly (2.14.8)

PERFORMANCE OUTCOMES:

Mechanic will:

- *2.14.8.3 Purge and charge GAS. (12 minutes)
- *2.14.8.7 Replace GAS panel reticle power switch (30 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.
Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training: Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
Accuracy - As indicated by:

- | | |
|---------------|--|
| Task 2.14.8.3 | a. Eight pounds per square inch (nitrogen) registers in GAS. |
| | b. GAS air valve cap in place. |

- | | |
|---------------|---|
| Task 2.14.8.7 | a. GAS panel reticle switch operates to brighten and dim GAS reticle. |
|---------------|---|

* TASK 2.14.8.3 PURGE AND CHARGE GAS

PARTS: None

TOOLS: Wrench, adjustable, 10 inch
Wrench, open end, 3/8 inch
Kit, purging, fire control 4931-00-065-1110
Cylinder, gas nitrogen

EXPENDABLES: None

PRELIMINARY PROCEDURE:

1. Position main gun over front of tank.

MECHANIC WILL:

1. Set up purging and charging equipment.
2. Unscrew and remove air valve cap from GAS using open end wrench.
3. Screw in and tighten hose fitting to air valve on sight using open end wrench.
4. Open pressure regulator valve on cylinder until low pressure gage shows eight pounds per square inch.
5. Purge GAS for five minutes.
6. Close valve and pressure regulator valve on cylinder.
7. Unscrew and remove hose fitting from air valve on sight using open end wrench.
8. Screw in and tighten valve cap onto GAS using open end wrench.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-87 to 3-89.

TIME:

12 Minutes

* TASK 2.14.8.7 REPLACE GAS PANEL RETICLE POWER SWITCH

PARTS:	Washers, lock, 6 ea. (number unknown) Gasket (number unknown) Nut (number unknown) Switch, toggle (number unknown)
TOOLS:	Key, socket head screw, 5/64 inch Wrench, open end, 9/16 inch Soldering iron Wrench, open end, 5/8 inch
EXPENDABLES:	Solder, flux cord Sealing compound, thread locking MIL-S-46163

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove two setscrews from three control knobs using key.
2. Unscrew and remove boot from base of reticle illumination control using 5/8 inch wrench.
3. Discard boot.
4. Unscrew and remove six screws and lockwashers from GAS panel using key.
5. Discard lockwashers.
6. Take panel off main housing.
7. Remove and discard gasket.
8. Unsolder two wires from reticle power switch using soldering iron.
9. Unscrew and remove nut from switch using 9/16 inch wrench.
10. Discard nut.
11. Remove and discard switch.
12. Put new switch in panel.
13. Screw on and tighten new nut using 9/16 inch wrench.
14. Apply sealing compound around nut.
15. Solder two wires to switch using soldering iron and solder flux.

***TASK 2.14.8.7 REPLACE GAS PANEL RETICLE POWER SWITCH (Cont'd.)**

16. Put new gasket on panel.
17. Put panel on main housing.
18. Screw in and tighten six screws and new lockwashers on panel using key.
19. Screw in and tighten new boot to base of reticle illumination control using 5/8 inch wrench.
20. Install three control knobs and secure with two setscrews on each knob using key.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-98 to 3-100.

TIME:

30 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Commander's Weapon Station Sight Assembly (2.14.9)

PERFORMANCE OUTCOMES:

Mechanic will:

- * 2.14.9.3 Purge and charge CWS sight (21 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- | | |
|---------------|---|
| Task 2.14.9.3 | a. Five to seven pounds per square inch (nitrogen) gas comes out of relief valve. |
| | b. No water comes out of relief valve. |
| | c. CWS valve cap in place. |

*TASK 2.14.9.3 PURGE AND CHARGE CWS SIGHT

PARTS: None

TOOLS: Wrench, open end, 3/8 inch
Wrench, open end, 1/2 inch
Wrench, open end, 1/2 inch
Tank, nitrogen, dry
Kit, purging, SC 4931-59CL-J54

EXPENDABLES: None

PRELIMINARY PROCEDURE:

1. Remove CWS.

MECHANIC WILL:

1. Look for ice or dirt on charging valve.
2. Clean off valve if necessary.
3. Unscrew and remove charging valve cap using 3/8 inch wrench.
4. Open nitrogen tank valve for one or two seconds.
5. Screw on and tighten regulator using 1 1/2 inch wrench.
6. Turn T-handle on regulator fully to left.
7. Open nitrogen tank valve and look for more than 100 pounds of pressure on gage. (If pressure is less than 100 pounds, get a new tank.)
8. Turn T-handle on regulator to right until five to seven pounds of pressure show on gage.
9. Let gas flow through hose for five to ten seconds, then close tank valve.
10. Screw on and tighten nut on hose to charging valve using 1/2 inch wrench.

CAUTION: Do not allow more than seven pounds of pressure flow into sight.
Damage to inside will occur.

11. Open tank valve and look for five to seven pounds of pressure on gage.
12. Turn T-handle on regulator to right while listening for gas coming out of relief valve.

* TASK 2.14.9.3 PURGE AND CHARGE CWS SIGHT (Cont'd.)

NOTE A: Gas should come out at five to seven pounds of pressure. If gas comes out below five pounds of pressure or does not come out at eight pounds of pressure, replace relief valve.

13. Let gas come out of relief valve for five minutes or until all traces of water are gone.
14. Close tank valve.
15. Watch gage for five minutes.

NOTE B: If pressure does not drop below five pounds, servicing is completed; go to step 16. If pressure drops below five pounds, turn and replace sight.

16. Slowly unscrew and remove hose fitting from charging valve using 1/2 inch wrench.
17. Screw on and tighten valve cap finger tight.

FOLLOW ON PROCEDURES:

1. Install CWS.
2. Boresight CWS sight.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-111 to 3-114.

TIME:

21 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Computer Electronics Unit (CEU) Assembly (2.14.10)

PERFORMANCE OUTCOMES:

Mechanic will:

*/#2.14.10.1 Replace computer electronics unit (CEU) (48 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

- | | |
|----------------|---|
| Task 2.14.10.1 | a. Screws holding CEU to rack torqued between 360 and 432 inch-pounds (41 to 49 newton meters). |
| | b. Jumper assembly attached to face of CEU. |
| | c. Cable connectors attached to CEU. |

***//TASK 2.14.10.1 REPLACE COMPUTER ELECTRONICS UNIT (CEU)**

PARTS:	Computer Electrical Unit (XM67194) Washers, lock, 2 ea.
TOOLS:	Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 7/16 inch Socket, socket wrench, 3/8 inch square drive, 9/16 inch Universal joint, socket wrench, 3/8 inch square drive Wrench, torque, 0 to 600 inch-pounds
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Disconnect three electrical cable connectors from CEU.
2. Remove one screw and two lockwashers securing jumper assembly to face of CEU using 7/16 inch socket and handle.
3. Discard lockwashers.
4. Remove three screws and washers securing CEU to rack using 9/16 inch socket, universal joint, and handle.
5. Remove CEU from rack and turn in.
6. Place new CEU into rack.
7. Install three screws and washers securing CEU to rack using 9/16 inch socket, universal joint, and handle.
8. Torque screws between 360 and 432 inch pounds (41 to 49 newton meters).
9. Install jumper assembly on face of CEU using one new lockwasher on each side of terminal.
10. Secure with screw using 7/16 inch socket and handle.
11. Connect three electrical cable connectors to CEU.

FOLLOW ON PROCEDURE:

1. Perform self test of computer.

REFERENCES:

DEP 9-2350-255-2-3-1; pp. 3-117 to 3-119.

TIME:

48 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Gun Turret Drive (GTD) Electronics Unit (2.14.12)

PERFORMANCE OUTCOMES:

Mechanic will:

- * 2.14.12.2 Replace gun turret drive electronics unit. (36 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- | | |
|----------------|--|
| Task 2.14.12.2 | a. Screws holding GTD unit to rack torqued between 96 and 120 inch-pounds (11 to 14 newton meters). |
| | b. Screw holding jumper assembly to terminal torqued between 48 and 60 inch-pounds (5 to 7 newton meters). |
| | c. Electrical connectors attached to top of GTD unit. |
| | d. Electrical connectors attached to receptacles J2 and J4. |

***TASK 2.14.12.2 REPLACE GUN TURRET DRIVE (GTD) ELECTRONICS UNIT**

PARTS:	Gun turret drive electronics box (NPN) Washer, lock, 2 ea. (MS35333-40)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, torque, 0 to 200 inch pounds Pliers, slip joint, conduct style, plastic jaw inserts Extension, socket wrench, 3/8 inch square drive, 6 inch
EXPENDABLES:	Sealing compound, thread locking, MIL-S-46163

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove electrical connectors from receptacles J2 and J4 from front of thermal imaging unit.
2. Unscrew and remove screw, two lockwashers, and jumper assembly from top of GTD unit using socket, extension, and handle.
3. Discard lockwashers.
4. Unscrew and remove three electrical connectors from top of GTD unit by hand.
5. Unscrew and remove eight screws and washers securing GTD unit to rack using socket and handle.
6. Pull out GTD unit and turn it in.
7. Slide new GTD unit into rack.
8. Screw in and tighten eight screws and washers securing GTD unit to rack using socket and handle.
9. Torque screws between 96 and 120 inch-pounds (11 to 14 newton meters) using torque wrench.
10. Spread sealing compound on threads of screw used to secure jumper assembly.
11. Install jumper assembly using one new lockwasher on each side of terminal and secure with screw using socket, extension, and handle.
12. Torque screw between 48 and 60 inch-pounds (5 to 7 newton meters) using torque wrench.

* TASK 2.14.12.2 REPLACE GUN TURRET DRIVE (GTD) ELECTRONICS UNIT

13. Screw in and tighten three electrical connectors to top of GTD unit by hand.
14. Screw in and tighten electrical connectors to receptacles J2 and J4 using pliers.

FOLLOW ON PROCEDURES:

1. Perform test GTD and stabilization system.
2. Perform GPS day sight counter rotation sealing.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-141 to 2-153.

TIME:

36 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Crosswind Sensor (2.14.13)

PERFORMANCE OUTCOMES:

Mechanic will:

- * 2.14.13.3 Replace crosswind sensor (44 minutes)

MEASUREMENT:

(for each task)

	Time - Between end of initiating stimuli and completion of task.
During Training:	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
End of Training:	Accuracy - As indicated by:

- | | |
|----------------|---|
| Task 2.14.13.3 | a. Ground strap installed on sensor stud and each side of terminal. |
| | b. Arrow on top of sevsor lined-up with center front of tank. |
| | c. Gasket in place on sensor lip. |
| | d. Electrical cable connector attached to receptacle. |
| | e. Cover attached to crosswind sensor |

* TASK 2.14.13.3 REPLACE CROSSWIND SENSOR

PARTS:	Gasket (XM7955) Crosswind sensor (XM64000) Washer, lock, 2 ea. (MS35333-40) Washer, coned, 6 ea. (XM65408-1) Cover (XM69199)
TOOLS:	Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 3/8 inch
EXPENDABLES:	Rags, wiping Solvent, cleaning, P-D-680, type 11

PRELIMINARY PROCEDURE:

1. Erect crosswind sensor.

MECHANIC WILL:

1. Unscrew and remove six screws and coned washers from cover using 7/16 inch socket and handle.
2. Discard coned washers.
3. Remove cover and inspect for cracks. (If cracked, get a new cover.)
4. Unscrew and remove electrical cable connector from receptacle by hand.
5. Unscrew and remove dummy connector cover from dummy connector.
6. Put dummy connector cover on receptacle.
7. Unscrew and remove screw and two lockwashers securing ground strap using 7/16 inch socket and handle.
8. Discard lockwashers.
9. Unscrew and slip off coupling from sensor by hand.
10. Remove gasket from sensor and inspect gasket for cuts and chips. (If damaged, replace gasket.)

<p>CATION: Sensor must be pulled out of retainer to avoid damage to electronic harness.</p>
--

* TASK 2.14.13.3 REPLACE CROSSWIND SENSOR (Cont'd.)

11. Slowly lift sensor out of retainer.
12. Unscrew and remove nut, flat washer, and ground strap from sensor stud using 3/8 inch socket and handle.
13. Turn in sensor and wiring harness.
14. Unscrew and remove nut from stud on new sensor using 7/16 inch socket and handle.

WARNING: Cleaning solvent burns easily.
Do not use solvent near open fire.

15. Clean area around sensor stud with solvent and rag and dry with clean rag.
16. Install ground strap on sensor stud using one new lockwasher on each side of terminal.
17. Secure with nut using 7/16 inch socket and handle.
18. Lower electrical harness through top of retainer and out of opening near dummy connector.
19. Line up arrow on top of sensor with center front of tank.
20. Lower sensor into retainer. (Make sure pin in bottom of retainer goes into hole on bottom of sensor.)
21. Put gasket on sensor lip.
22. Slide coupling down sensor to retainer.
23. Screw on and tighten coupling by hand.
24. Clean area around ground strap hole with solvent and rag and dry with clean rag.
25. Install ground strap using one new lockwasher on each side of terminal.
26. Unscrew dummy connector cover from receptacle.
27. Screw cap into dummy connector.
28. Screw on and tighten electrical cable connector to receptacle.
29. Hold cover on mount and secure with six screws and new coned washers using 7/16 inch socket and handle.

FOLLOW ON PROCEDURES:

1. Run computer self-test.
2. Clean sensor.

REFERENCES:

DDI 9-2350-215-21-1-3-1; pp. 3-168 to 3-171, 3-179 to 3-182.

*TASK 2.14.13.3 REPLACE CROSSWIND SENSOR (Cont'd.)

TIME:

44 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Cant Assembly (2.14.14)

PERFORMANCE OUTCOMES:

Mechanic will:

- * 2.14.14.2 Replace cant unit (15 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- Task 2.14.14.2 a. Screws holding cant unit to turret torqued between 30 and 36 foot-pounds (41 to 49 newton meters).
- b. Electrical connector attached to cant unit.

* TASK 2.14.14.2 REPLACE CANT UNIT

PARTS:	Cant Unit Assembly (XM61470)
TOOLS:	Handle, socket wrench, ratchet, 1/2 inch square drive Extension, socket wrench, 1/2 inch square drive, 5 inch Socket, socket wrench, 1/2 inch square drive, 9/16 inch Wrench, torque, 0 to 150 foot-pounds Brush, wire
EXPENDABLES:	Solvent, cleaning P-D-680, type 11 Rags, wiping

PRELIMINARY PROCEDURES:

1. Engage elevation lock.
2. Manually traverse turret as needed for access.

MECHANIC WILL:

1. Disconnect electrical connector from cant unit.
2. Hold cant unit with hand and unscrew and remove three screws and washers securing cant unit to turret using socket, extension, and handle.
3. Turn in cant unit.

WARNING: Solvent P-D-680, type 11 burns easily. Do not use solvent near open fire.

4. Clean mounting pad with solvent, rag, and brush and dry with clean rag.
5. Put new cant unit in place.
6. Secure with three screws and washers using socket, extension, and handle.
7. Torque screws between 30 and 36 foot-pounds (41 to 49 newton meters) using torque wrench.
8. Connect electrical connector to cant unit.

FOLLOW ON PROCEDURE:

1. Run computer self-test.

REFERENCES:

DDP 9-2350-255-20-2-3-1; pp. 3-183 to 3-185.

* TASK 2.14.14.2 REPLACE CANT UNIT (Cont'd.)

TIME:

15 Minutes

XMI 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Rate Gyroscope Assemblies (2.14.15)

PERFORMANCE OUTCOMES:

Mechanic will:

2.14.15.1 Replace hull gyroscope (30 Minutes)

MEASUREMENT:

(for each task)

	Time - Between end of initiating stimuli and completion of task.
During Training:	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
End of Training:	Accuracy - As indicated by:

Task 2.14.15.1	a. Screws holding gyroscope in place torqued between 96 and 120 inch-pounds (11 to 14 newton meters).
	b. Electrical connector attached to gyroscope.

TASK 2.14.15.1 REPLACE HULL GYROSCOPE

PARTS: Gyroscope, hull (P30766)

TOOLS: Handle, socket wrench, ratchet, 3/8 inch square drive
Socket, socket wrench, 3/8 inch square drive, 7/16 inch
Universal, socket wrench, 3/8 inch square drive, 2-inch
Wrench, torque, 0 to 200 inch pounds

EXPENDABLES: Sealing compound, thread locking MIL-S-46163

PRELIMINARY PROCEDURE:

1. Manually traverse turret to position main gun over left rear fender.

MECHANIC WILL:

1. Open turret floor access door.
2. Unscrew and remove electrical connector by hand.
3. Hold gyroscope and unscrew and remove four screws and washers using socket, universal joint, and handle.
4. Remove gyroscope and turn it in.
5. Spread compound on four screw threads.
6. Hold new gyroscope in place and secure with four screws and washers using socket, universal joint, and handle.
7. Torque screws between 96 and 120 inch pounds (11 to 14 newton meters) using torque wrench.
8. Push on and tighten electrical connector by hand.
9. Close turret floor access door.

FOLLOW ON PROCEDURE:

1. Test gyroscope.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-187 and 3-188.

TIME:

30 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Gunner's Handle Assembly (2.14.16)

PERFORMANCE OUTCOMES:

Mechanic will:

- * 2.14.16.1 Replace Gunner's control handle assembly (24 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- | | |
|----------------|--|
| Task 2.14.16.1 | a. Screws holding Gunner's handle in place torqued between 180 and 200 inch-pounds (20 to 23 newton meters). |
| | b. Emergency mode azimuth and elevation drift adjusted. |

* TASK 2.14.16.1 REPLACE GUNNER'S CONTROL HANDLE ASSEMBLY

PARTS: Handle, gunner's (NPN)

TOOLS: Extension, socket wrench, 3/8 inch square drive, 6 inch
Handle, socket wrench, ratchet, 3/8 inch square drive
Socket, socket wrench, 3/8 inch square drive, 9/16 inch
Wrench, torque, 0 to 600 inch pounds
Wrench, box end, 15/64 inch

EXPENDABLES: Sealing compound, thread locking, MIL-S-46163

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove electrical connector by hand.
2. Unscrew and remove three screws and washers from left side of gunner's control assembly using socket, extension, and handle.
3. Turn in gunner's handles.
4. Check emergency mode azimuth and elevation drift.
5. Adjust if needed. (See Task 2.7.4.4.)
6. Put three washers on screws and spread compound on threads of screws.
7. Hold new handle in place and secure with three screws using socket, extension, and handle.
8. Torque screws between 180 and 200 inch pounds (20 to 23 newton meters) using torque wrench.
9. Screw on and tighten electrical connector by hand.

FOLLOW ON PROCEDURE:

1. Test gunner's handle.

REFERENCES:

DEP 9-2350-255-2-3-1; pp. 3-197 to 3-198.

TIME:

24 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Laser Rangefinder (2.14.17)

PERFORMANCE OUTCOMES:

Mechanic will:

*2.14.17.3 Purge and charge laser rangefinder (24 minutes)

MEASUREMENT:

(for each task)

During Training:

Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

End of Training:

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

- | | |
|----------------|---|
| Task 2.14.17.3 | a. Five pounds per square inch (nitrogen) registers in laser rangefinder. |
| | b. Screws and packing in exhaust and entrance ports. |

*** TASK 2.14.17.3 PURGE AND CHARGE LASER RANGEFINDER**

PARTS:	Packing, preformed (NPN)
TOOLS:	Screwdriver, cross tip, Number 1, 3 inch Wrench, open end, 3/8 inch Kit, purging, fire control, 4931-00-065-1110 Cylinder, gas, nitrogen
EXPENDABLES:	Grease, braycote 3L-38RP

PRELIMINARY PROCEDURE:

1. Position main gun over front of tank.

NOTE A: This task is performed by two mechanics.
They are described as Soldier A and
Soldier B.

MECHANIC WILL:

1. Soldier A/B: Place purging kit and gas cylinder on ground on left side of tank.
2. Soldier A: Unscrew cylinder valve until gas can be heard.
3. Soldier A: Tighten valve by hand.
4. Soldier A: Screw on and tighten adapter using adjustable wrench.
5. Soldier A: Fully close regulator valve by turning counter-clockwise.
6. Soldier A: Unscrew cylinder valve and look for pressure on high pressure gage located closest to cylinder. (If pressure is less than 100 pounds per square inch, replace with new cylinder of gas.)
7. Soldier B: Enter tank and bring hose through commander's hatch.
8. Soldier B: Unscrew and remove entrance port screw and exhaust port screw using screwdriver.
9. Soldier B: Remove and discard packing from exhaust port.
10. Soldier B: Screw on and tighten hose fitting to entrance port using adjustable wrench.
11. Soldier A: Open regulator valve by turning clockwise while watching gage.
12. Soldier A: Stop turning valve when 5 pounds per square inch is reached on gage.

* TASK 2.14.17.3 PURGE AND CHARGE LASER RANGEFINDER (Cont'd.)

13. Soldier B: Listen for gas coming out of exhaust port.
14. Soldier B: Purge rangefinder for five minutes.
15. Soldier A: Close cylinder valve after five minutes and tell Soldier B that valve is closed.
16. Soldier B: Unscrew and remove hose fitting from entrance port using adjustable wrench.
17. Soldier B: Screw in and tighten screw and new packing into exhaust port.
18. Soldier B: Screw in and tighten screw into entrance port.
19. Soldier A/B: Remove purging kit.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-1; pp. 2-23 to 2-25.

TIME:

24 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Thermal Imaging System (2.14.18)

PERFORMANCE OUTCOMES:

Mechanic will:

2.14.18.6 Clean TIS image control unit optical surface. (6 minutes)

MEASUREMENT:

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

End of Training: Accuracy - As indicated by:

- | | |
|----------------|--|
| Task 2.14.18.6 | a. Dirt removed from outside glass under ballistic shield. |
| | b. Windows not scratched. |

TASK 2.14.18.6 CLEAN TIS IMAGE CONTROL UNIT OPTICAL SURFACE

PARTS:	None
TOOLS:	Brush, artist's
EXPENDABLES:	Clean water Cleaning compound, optical lens P-C-438 Paper, lens tissue, NNI-P-40, type IV

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Open GPS left ballistic door.
NOTE A: The TIS germanium window is delicate. It is to be cleaned only when proper operation of TIS requires it. Do not scratch the windows and do not apply excessive finger or water pressure. Do not clean this window with dry cloth or dry tissue as the surface is easily damaged.
2. Rinse outside glass under ballistic shield with clean water until all dirt is removed.
3. If further cleaning is necessary, thoroughly soak lens tissue with cleaning compound.
4. Gently clean glass using light pressure and swirling or dabbing motion.
5. Flush with clean water and let glass air dry.
6. Brush lenses lightly using artist's brush to remove dust.
7. Clean lenses by thoroughly soaking lens tissue with cleaning compound and gently clean lenses using light pressure and swirling or dabbing motion.
8. Close GPS left ballistic door.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9-2350-255-20-2-1; p. 2-10.

TIME:

6 Minutes

MODULE:

COMPONENT:

PERFORMANCE OUTCOMES:

Mechanic will:

MEASUREMENT:

(for each task)

During Training:

Time	- Between end of initiating stimuli and completion of task.
Accuracy	- As indicated by match between steps indicated for each task and steps performed by mechanic.

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

End of Training: Accuracy - As indicated by:

11-58

TASK 2.14.19.1 REPLACE REMOTE THERMOMETER

PARTS:	Thermometer (XM66028) Grommet, rubber (MS35489-101) Washer, lock, 9 ea. (MS35333-36)
TOOLS:	Screwdriver, flat tip Wrench, combination, 7/16 inch Wrench, combination, 11/16 inch
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

1. Open ready ammunition door.
2. Remove commander's oddment box.
3. Remove power control unit bracket.
4. Remove commander's control panel.
5. Remove commander's control handle.

MECHANIC WILL:

1. Unscrew and remove three screws and lockwashers from three straps using 7/16 inch wrench.
2. Discard lockwashers.
3. Remove three straps.
4. Unscrew and remove three screws and lockwashers from three clamps using 7/16 inch wrench.
5. Discard lockwashers.
6. Remove three clamps.
7. Remove grommet from plate and discard grommet.

WARNING: Cable may be in with other cables. Care must be used when taking cable out to separate wires.

8. Unscrew and remove three screws and lockwashers from thermometer using screwdriver.
9. Discard thermometer.

TASK 2.14.19.1 REPLACE REMOTE THERMOMETER (Cont'd.)

10. Remove thermometer bulb from tubing and bracket in ammunition compartment by holding swivel nut with 7/16 inch wrench while unscrewing bulb with 11/16 wrench.
11. Carefully guide cable out through two bulkhead plates.
12. Turn in thermometer.
13. Guide new thermometer bulb and cable in through two bulkhead plates.
14. Secure bulb in place by holding swivel nut with 7/16 inch wrench and tightening nut with 11/16 inch wrench.
15. Put three clamps and three straps on cable.
16. Secure with six screws and new lockwashers using 7/16 inch wrench.
17. Hold thermometer in place.
18. Secure with three screws and new lockwashers using screwdriver.
19. Put grommet over cable and slide grommet into plate hole.

FOLLOW ON PROCEDURES:

1. Close ammunition door.
2. Install commander's control panel.
3. Install commander's control handle.
4. Install commander's oddment box.
5. Check out remote thermometer gage.
6. Install power control unit bracket.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-235 to 3-240.

TIME:

24 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

Loader's Unity Periscope (2.14.20)

PERFORMANCE OUTCOMES:

Mechanic will:

2.14.20.1 Replace Loader's periscope mirror mount assembly (14 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

Task 2.14.20.1 a. New mirror mount assembly installed.
--

TASK 2.14.20.1 REPLACE LOADER'S PERISCOPE MIRROR MOUNT ASSEMBLY

PARTS:	Mirror mount assembly (XM65473) Pin, cotter (MS24665-170)
TOOLS:	Pliers, slip joint
EXPENDABLES:	None

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Remove two special screws and clamps from periscope sides by holding screwhead with one hand and remove threaded clamp with other hand. (Mirror mount will swing down).
2. Hold mirror mount with one hand.
3. Remove cotter pin and straight pin using pliers.
4. Discard cotter pin.
5. Pull mirror mount assembly out of periscope housing and turn in.
6. Position new mirror mount assembly in periscope housing aligning pin holes.
7. Position straight pin in pivoting holes and push in by hand.
8. Install new cotter pin in straight pin hole using pliers.
9. Position mirror mount assembly aligning holes of mirror mount with holes on periscope housing.
10. Secure with two special screws and clamps.
11. Push mirror mount up and tighten clamp hand tight.

FOLLOW ON PROCEDURES:

None

REFERENCES:

DEP 9 2350-255-20-2-3-1; pp. 3-229 to 3-233.

TIME:

14 Minutes

XM1 45E TURRET MECHANIC COMPONENT OUTLINE

MODULE :

Fire Control System (2.14)

COMPONENT:

Commander's Control Handle (2.14.22)

PERFORMANCE OUTCOMES:

Mechanic will:

*/#2.14.22.1 Replace Commander's control handle assembly (18 minutes)

MEASUREMENT :

(for each task)

During Training: Time - Between end of initiating stimuli and completion of task.

Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.

Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.

Accuracy - As indicated by:

- Task 2.14.22.1 a. Screws holding control handle assembly in place torqued between 360 and 430 inch-pounds (41 to 49 newton meters).
- b. Electrical connector attached to control handle assembly.

*// TASK 2.14.22.1 REPLACE COMMANDER'S CONTROL HANDLE

PARTS:	Control assembly, commander's (P30764)
TOOLS:	Extension, socket wrench, 3/8 inch square drive, 6 inch Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 7/16 inch Wrench, torque, 0 to 600 inch pounds
EXPENDABLES:	Sealing compound, thread locking, MIL-S-46163

PRELIMINARY PROCEDURES:

None

MECHANIC WILL:

1. Unscrew and remove electrical connector from control handle assembly by hand.
2. Unscrew and remove three screws and washers securing control handle assembly to bracket using 7/16 inch socket, extension, and handle.
3. Lift handle off bracket and turn in handle.
4. Spread thin coat of sealing compound on threads of three screws.
5. Put new control handle assembly on bracket.
6. Secure with three screws and washers using 7/16 inch socket, extension, and handle.
7. Torque three screws between 360 and 430 inch pounds (41 to 49 newton meters) using torque wrench.
8. Screw in and tighten electrical connector to control handle assembly by hand.

FOLLOW ON PROCEDURE:

1. Operate commander's control handle.

REFERENCES:

DEP-9-2350-255-40-2-3-1; pp. 3-199 to 3-201

TIME:

18 Minutes

XM1 45E TURRET MECHANIC
COMPONENT OUTLINE

MODULE:

Fire Control System (2.14)

COMPONENT:

CWS Manual Elevation Drive (2.14.24)

PERFORMANCE OUTCOMES:

Mechanic will:

2.14.24.2 Replace CWS cable assembly and lever. (43 minutes)

MEASUREMENT:

(for each task)

During Training:	Time - Between end of initiating stimuli and completion of task.
	Accuracy - As indicated by match between steps indicated for each task and steps performed by mechanic.
End of Training:	Time - Between end of initiating stimuli and completion of task, not to exceed job-time requirements.
	Accuracy - As indicated by:

- | | |
|----------------|---|
| Task 2.14.24.2 | a. Caliber .50 machinegun lever not bent or broken. |
| | b. Commander's caliber .50 machinegun operates. |

TASK 2.14.24.2 REPLACE CWS CABLE ASSEMBLY AND LEVER

PARTS:	Cable assembly (XM66575) Pin, cotter, 2 ea. (MS24665-132) Lever (XM66710)
TOOLS:	Handle, socket wrench, ratchet, 3/8 inch square drive Socket, socket wrench, 3/8 inch square drive, 7/16 inch Wrench, open end, 7/16 inch (two required) Pliers, slip joint
EXPENDABLES:	None

PRELIMINARY PROCEDURE:

1. Unload and clear commander's weapon.

MECHANIC WILL:

1. Remove cotter pin securing straight pin to manual drive assembly using pliers.
2. Discard cotter pin and remove straight pin.
3. Using two open end wrenches, loosen two nuts securing cable to bracket on manual drive assembly.
4. Pull out cable and remove two nuts from cable.
5. Remove cotter pin securing straight pin to lever on CWS machine gun mount using pliers.
6. Discard cotter pin and remove straight pin.
7. Using two open end wrenches, loosen two nuts securing cable.
8. Pull off cable and remove two nuts.
9. Unscrew and remove screw and washer from clamp using socket and handle.
10. Unscrew and remove two screws and washers from two clamps on bracket for ammunition box using socket and handle.
11. Pull out cable.
12. Unscrew and remove two plates screws, and washers from support of machine gun mount using socket and handle.
13. Pull out cable and turn it in.
14. Press down on pin to free machine gun lever.
15. Lift out lever.

TASK 2.14.24.2 REPLACE CWS CABLE ASSEMBLY AND LEVER (cont'd)

16. Inspect lever for bends or breaks. (If damaged, replace lever.)
17. Install lever on end of pin.
18. Press lever into place.
19. Thread new cable through support of machine gun mount.
20. Put two plates in place and screw in two screws and washers using open end wrench. (Do not tighten screws.)
21. Pull cable through support to manual drive assembly.
22. Slip two nuts onto cable.
23. Secure cable on manual drive assembly with straight pin.
24. Install new cotter pin on straight pin using pliers.
25. Position cable on manual drive assembly bracket with one nut on each side of bracket.
26. Tighten two nuts using two open end wrenches.
27. Thread cable through two clamps on bracket for ammunition box.
28. Screw on two screws and washers by hand. (Do not tighten.)
29. Thread cable through clamps.
30. Screw on screw and washer by hand. (Do not tighten.)
31. Slip two nuts onto cable.
32. Secure cable on lever on CWS machine gun mount with straight pin.
33. Install new cotter pin on straight pin using pliers.
34. Position cable on bracket with one nut on each side of bracket.
35. Arrange cable so it moves freely.
36. Tighten all loose screws and nuts.

FOLLOW ON PROCEDURE:

1. Operate commander's machine gun.

REFERENCES:

DEP 9-2350-255-20-2-3-1; pp. 3-55 to 3-59.

TIME

45 Minutes

APPENDIX I
PERFORMANCE-ORIENTED INSTRUCTION

BASIC PRINCIPLES OF PERFORMANCE-ORIENTED INSTRUCTION¹

1. Present only the information the mechanic must know to perform the task adequately and safely.
 - a. This means that you must tell the mechanic only what he must do and how to do it adequately and safely.
 - b. Conversely, it also means that you must eliminate extraneous or "nice-to-know" information, such as historical background, technical information that has nothing to do with the task, and "war stories" and other anecdotes. Such information does not help the mechanic learn -- it just wastes valuable time.
2. Present the essential "how to" information only when the mechanic needs it for task performance, a step at a time.
 - a. This means that you must avoid showing and explaining how to perform a task before he has a chance to use the information. The reason for avoiding this is that the mechanic won't remember your instructions, and you must give it all to him again when he has a chance to perform. This wastes much time.
 - b. This principle is often violated when an instructor gives "how to" information during a conference session before a mechanic needs it to perform in a practical exercise situation.
3. Require the mechanic to apply the "how to" information immediately in "hands on" task performance.
 - a. This means that the mechanic must do what you do as soon as possible after you demonstrate and explain how to perform a step, and you must see that he does it, not just watch and listen.
 - b. This gets the mechanic to learn by doing, which is the best way to learn a task. Remember to require him to learn to do, not learn to talk about doing.
 - c. Requiring the mechanic to apply the information in "hands on" performance puts an important responsibility on the trainer. That responsibility is to establish situations during practice periods that will cause the mechanic to learn how to perform a task. Here, there is one important thing to watch for. What you prepare for the mechanic to do as a practical exercise will depend primarily on the type of job task he is to learn. In most cases the practical exercise situation will be straightforward as you will be working with a task in which the conditions, procedure and outcome never vary. The mechanic will repeatedly work with the same information, practice the same procedure and attempt to achieve the same outcome each practice trial.

¹Osborn, W. L., Ford, J. P., Moon, H. L., Campbell, R. C., Root, R. L., and Ward, L. E. Course Outline: Instruction for Unit Trainers in How to Conduct Performance Training. Human Resources Research Organization (HRRRO), Final Report (FR-CD-L-75-3), 1975.

In these cases you will simply have the mechanic practice the procedure until he can do it correctly. In other cases the basic procedure in performing a task will not change, but certain given conditions or information govern the outcome of task performance. So, when you are preparing the practice session, be sure to consider the type of task to be learned -- is it the type that must be practiced under different conditions or with different information given, or must the procedure be practiced under the same conditions and with the same information each time.

4. Permit each mechanic to learn each step and develop his skill at his own pace.

- a. For various reasons, individuals learn at various rates, and they learn best at their own pace.
- b. This principle also allows a mechanic to practice as little or as much as he needs to develop a skill.
- c. Fast learners can be tested (checked out) while slower learners are still developing their skill. Fast learners can then be assigned to help the slower learners who need help. This can make your job as an instructor much easier and speed up the training. One note of caution: if you do use peer instructors, be sure they apply the principles of performance training and demonstrating that you have applied.

5. Aid mechanics' learning by coaching them.

- a. Coaching involves four things:
 - (1) Telling or showing a mechanic as many times as necessary for him to learn something difficult.
 - (2) Prompting recall of what to do next, or of how to do something, by asking questions.
 - (3) Preventing a mechanic from doing something wrong. It is better to prevent an error, if possible, than to have a mechanic correct it, especially if the error would cause personal injury or equipment damage.
 - (4) Reinforcing correct performance by assuring the mechanic that he is doing something correctly. When you tell a mechanic he is doing it right, he is encouraged to try harder and he learns faster. Unfortunately, many instructors either fail to give positive reinforcement or fail to give it as often as they should.
- b. One thing should be remembered about coaching: the mechanic is the one who should be practicing, not you. If you show him how to do a step in a task, return the equipment to its previous condition so he can do that part of the task.

6. Establish quality control by reliably administering performance tests. Training is effective if the mechanics are able to perform the task to the level specified in the task analysis by the training objective. Performance tests are the tools to help you determine whether the objectives have been mastered. A discussion on test development and some performance test examples are at Appendix J.

GUIDANCE FOR CONDUCTING PERFORMANCE-ORIENTED INSTRUCTION¹

1. Prepare to demonstrate the task.

- a. Obtain the training objective and performance test.
You must have the performance test to adequately check student performance after training.

Check the objective carefully. This exactly what the mechanics must do.

Insure you can perform the task.

- b. Identify all acts and key (critical) points in performance of the task.

Perform the task and pay careful attention to everything you do, regardless of how small an act may be, and ask yourself why you do everything you do. This will enable you to explain it to the mechanics.

Note all possibilities for injury of self or others and how to avoid them.

Note all possibilities for damage to equipment or materials and how to avoid them.

Note all acts that must be done in sequence for task performance.

Note all specific acts that must be done at certain points to make the task easier.

Note all conditions of equipment or materials at certain points to make the task easier.

- c. Prepare the set-up for demonstration so that everyone can clearly see and hear you.

Position equipment and materials so mechanics can see the demonstration mechanics as they will when they are performing the task.

Assure that mechanics are placed so they can hear you.

If available, use training aids to show relationships of parts or difficult steps in a procedure, such as exploded views or overlay transparencies.

¹Chambers, W.C., Ford, J.P., Moon, H.L., Campbell, R.C., Root, R.L., and Ward, A.E. Course Outline: Instruction for Unit Trainers in How to Conduct Performance Training. Human Resources Research Organization (CH2O), Final Report (HR-CD-1-75-3), 1975.

When appropriate, provide mechanics with job aids, such as procedural checklists, troubleshooting routines, or manuals.

2. Orient students to the equipment and materials and to the task.
3. Briefly identify the equipment and materials and state their purpose, if necessary. Do not give "nice-to-know" information, such as historical background, technical characteristics, or how it does what it does.
4. Precisely state the training objective and tell mechanics exactly what they must be able to do upon the completion of training on that task.
5. Demonstrate and explain the task to be learned.
 - a. Emphasize that they must perform the task as you will demonstrate it to them.
 - b. Show and explain one step at a time in accordance with the training objective.
 - c. Identify for the mechanics the part or parts you will work with or on in each step.
 - d. Speak loudly enough to be heard.
 - e. Speak to be understood; that is, speak deliberately and use non-technical terms.
 - f. Strongly emphasize each key (critical) point you have noted in your analysis of the task. Don't just mention them; emphatically call attention to them.

Explain why a step must be performed in a particular way--to prevent personal injury or equipment damage, or to avoid unnecessary difficulty in performing the step.

6. Make what you do clearly visible from the mechanics' viewpoint.

The "mechanics' viewpoint" is (or very nearly) the direction in which the mechanic will see his hands and what he will work with or on when performing the task.

If precisely what you do must be hidden from view, carefully show what you will be working on and carefully explain how you will perform so that their mental imagery can give them some idea of the precise action. If the task is a soft skill task and you are doing something mentally, insure you explain how and why you are doing it. (You may have to coach the mechanics on such acts during the walk-through phase.)

BEST AVAILABLE COPY

7. After demonstrating and explaining each step, ask for and answer relevant questions, but defer irrelevant questions.
 - a. When mechanics ask questions relevant to performance of a step, answer them by carefully showing and explaining again what they want to know.
 - b. If the questioner is a slow learner and continues to query after his peers understand a step, politely tell him you will show him how to do it during the walk-through.
 - c. If a mechanic asks a question irrelevant to performance of a step, tell him to ask you again during the break period. Such questions usually are asked by technically oriented students who want "nice-to-know" information.
 - d. Always resist temptation to give extraneous information during instruction. Instructional time is precious. Concentrate on giving only essential information.
8. Pace your showing and explaining to the learning ability of the mechanics.
 - a. For various reasons, people learn at different rates.
 - b. You can judge the appropriateness of your pace by observing the mechanics during the demonstration.
 - c. Ask questions to see that they understand.
9. When appropriate, demonstrate alternate procedures for performing a task under different conditions.
 - a. An example is a modified procedure for performing a task at night, rather than in daytime.
 - b. Alternate procedures, if much different, should be taught after the basic (usual) procedure has been mastered.
10. Use the walk-through phase. (If task is simple, this phase may be omitted. If the task is difficult, several repetitions may be necessary.)
 - a. Go through the walk-through by telling the mechanics when to perform each step.
 - b. Have the mechanics perform each step and observe performance.
 - c. Encourage those who have difficulty.
 - d. Reinforce correct performance by saying, "That's right," "Yes," "Fine," or the like.

11. Supervise practice.

- a. Require mechanics to perform without your telling them when and how to perform each step, unless individuals need help.
- b. Coach those who need help.
 1. They may need only prompting to recall what to do and how to do it.
 2. If you see someone about to do something wrong, stop him and coach him through the step. It is better to prevent a mistake than to correct it.
 3. If you must demonstrate a step, be sure to require the mechanic to perform it, not just go on to the next step.
- c. Reinforce correct performance by letting them know they are doing well.
- d. Qualify, assign and supervise peer (assistant) instructors.
 1. If the task is relatively simple, you will recognize fast learners whom you can assign as peer instructors to aid one or more slower learners.
 2. If task is difficult or dangerous, qualify the fast learners by asking them "smoke out" questions about key points to be sure they understand: "Why do you do that?" "What would happen if . . .?" "How can you be sure that . . .?"
 3. If mechanics are in small groups, the first one to walk through probably can qualify as the assistant.
 4. You must observe peer instructors to be sure that they are prompting and coaching correctly.
- e. When mechanics have learned the task procedure, instruct them to practice to develop skill and speed.
 1. Inform them of the performance standard and time limitation for task performance.
 2. Instruct mechanic to let you know when he thinks he is ready for check-out (testing) on the tasks in the component.

12. Administer performance tests. (See Appendix J.)

APPENDIX J
TEST DEVELOPMENT

Each hands-on test will have four major parts:

- . Performance measures, which consist of actions that the mechanic must perform or specifications of the product of correct performance. Each performance measure is scored as Pass or Fail during the test, and a pre-determined number of performance measures must be scored Pass (normally all) for the mechanic to receive a GO on the test.
- . Test conditions, which include acceptable environmental conditions, equipment, tools, and manuals required, and test set-up.
- . Instructions to the mechanic, consisting at a minimum of the task statement, including any special information on where the mechanic is to start and complete the task if the full task is not to be performed.
- . Instructions to the test administrator, telling him how to set up the test, how to handle each mechanic during the test, where to position himself to be able to observe the mechanic, and any special instructions on how to score.

As with any test development, the starting point should be the task analysis or task summary. Be certain that it is complete, and that standards for correct performance are specified. Concentrate on the production of good performance measures (either product, process, or a combination of both). During development and refinement of these performance measures, you should keep in mind what condition the equipment must be in, what guidelines the test administrator will need, and what instructions the mechanic will require. If you do this and maintain an informal note system as you refine the performance measures, the test conditions and instructions to mechanics and test administrators will essentially be written by the time the performance measures are completed.

Two sample hands-on tests follow. Guidance on how to develop hands-on tests is contained in Chapter 4 of Guidelines for Development of Skill Qualification Tests (Department of the Army, December 1977).

HANDS-ON TEST

TASK 2.7.4.2 REPLACE AZIMUTH SERVO ASSEMBLY

A. REQUIRED EQUIPMENT

Servo, azimuth
Packing, preformed (elbow) (four)
Packing, preformed (front adapter) (four)
Packing, preformed (sliptube) (four)
Tags, identification (four for each soldier tested)
Rags
Liquid measure, two quart (two)
Extension, socket wrench, 1/2-inch square drive, 10-inch
Handle, socket wrench, hinged, 1/2-inch square drive
Socket, socket wrench, 1/2-inch square drive, 3/4-inch
Wrench, open end, 9/16-inch
Wrench, open end, 1 1/2-inch
Wrench, torque, 0 to 175 foot-pounds
TM 9-2350-255-20-2-3-1
Tank, XMI

B. PROCEDURE TO SET UP STATION

1. Reduce hydraulic pressure to zero.
2. Remove basket screen.
3. Set aside two of each type of packing.
4. Place TM on gunner's seat.
5. Place the following items on floor of driver's compartment.
 - a. Servo
 - b. Two each of following preformed packing:
 - 1) elbow
 - 2) front adapter
 - 3) sliptube
 - c. Identification tags
 - d. Pencil
 - e. Both liquid measures
 - f. Socket wrench extension
 - g. Socket wrench handle
 - h. 1/2-inch socket
 - i. 3/4-inch socket

- j. 9/16-inch open end wrench
- k. 1 1/2-inch open end wrench
- l. torque wrench

C. PROCEDURE TO PREPARE TO TEST EACH SOLDIER

- 1. Pair "discarded" packings. For the last soldier tested each day lay out unused packings.
- 2. Separate socket and extension from socket wrench.
- 3. Discard used identification tags.
- 4. Lay out equipment as required by paragraphs B4 and B5.
- 5. Traverse turret in manual until gun is over center front.

D. PROCEDURE TO CONDUCT AND SCORE THE TEST

- 1. Begin the test with the tested soldier in the gunner's compartment.
- 2. Read the instructions and score the procedure from the loader's compartment.
- 3. To pass PM 8, "Supports servo during removal," the soldier must hold the servo from the time he puts the wrench on the sixth screw until he sets the servo down. If the soldier starts to remove the sixth screw without supporting the servo, tell him to hold the servo; score the PM FAIL.
- 4. To pass PM 12, 13, and 14, the soldier must install the correct "unused" packing for each connection. If a soldier starts to install the incorrect type of packing, stop him, mark the PM FAIL, and tell him which type of packing to install. If a soldier, other than the last soldier to be tested, starts to install a packing that he removed, also mark the PM FAIL but do not correct him. If the last soldier starts to install a used packing, stop him, mark the PM FAIL, and tell him which packing to install. The XML must not be operated with used packings.
- 5. To pass PM 13, 14, and 20, the soldier must connect and tighten each elbow, adapter, and hose. Consider the connection to be tight only if the soldier applies a wrench.
- 6. To pass PM 16, "Supports servo during installation," the soldier must hold the servo until the second screw is installed. If the soldier releases the servo before tightening the second screw, tell him to hold the servo; mark the PM FAIL.
- 7. To score PM 18, "Tightens screws with the torque wrench," score only whether the soldier applies the torque wrench. Do not score the amount of torque.
- 8. To score PM 19, "Installs hoses without crossing hoses," note whether the soldier connects each hose at the correct point. If the soldier starts to connect a hose at an incorrect point, tell the soldier where to connect the hose; score PM 19 FAIL.
- 9. Soldiers may tag the lines, but they are not scored on whether they tag the lines.

SCORESHEET

REPLACE AZIMUTH SERVO ASSEMBLY

INSTRUCTIONS TO SOLDIER: For this test you must replace the azimuth servo assembly. Assume that the packings and rings on the floor are new. If you discard any item, put it in one of the cans. Hydraulic pressure has been zeroed. You have 35 minutes to replace the azimuth servo assembly.

PERFORMANCE MEASURES	PASS	FAIL
1. Manually traverses the turret until the servo assembly is accessible (gun over left front fender).	_____	_____
2. Puts a liquid measure under servo before disconnecting any hose.	_____	_____
3. Disconnects the three electrical plugs.	_____	_____
4. Disconnects the four hoses.	_____	_____
5. Caps hoses as they are disconnected.	_____	_____
6. Removes plugs and hoses before removing screws that secure servo.	_____	_____
7. Removes screws that secure servo.	_____	_____
8. Supports servo during removal of last two screws.	_____	_____
9. Removes packings and rings from top of servo.	_____	_____
10. Removes two elbows and packings from servo.	_____	_____
11. Removes two front adapters and packings from servo.	_____	_____
12. Installs new rings and new sliptube packings on top of replacement servo.	_____	_____
13. Installs elbows and new elbow packings.	_____	_____
14. Installs adapters and new front adapter packings.	_____	_____
15. Installs elbows and adapters before installing servo.	_____	_____
16. Supports servo during installation of first two screws.	_____	_____
17. Installs remaining five screws and washers.	_____	_____
18. Tightens screws with torque wrench.	_____	_____
19. Removes caps from hoses before installing hoses.	_____	_____
20. Installs hoses without crossing hoses.	_____	_____
21. Installs three electrical plugs.	_____	_____
22. Completes replacement within 35 minutes.	_____	_____

HANDS-ON TEST

TASK 2.7.15.2 SERVICE MAIN ACCUMULATOR

A. REQUIRED EQUIPMENT:

Nitrogen, technical (gray with two black rings)
(1 new tank for each 10 soldiers tested)
Charging device, accumulator, 11615420
Adapter, gas cylinder, 11658921 (if charging device does not
fit nitrogen tank)
Wrench, open end, 1 1/2 inch
Wrench, open end, 1 1/8 inch
Wrench, open end, 7/16 inch
Wrench, combination, 3/4 inch
Wrench, combination, 3/8 inch
TM 9-2350-255-20-2-3-1
Tank, XM1

B. PROCEDURE TO SET UP THE STATION:

1. Check pressure on nitrogen tank to be sure the pressure is between 1000 and 2000 pounds.
2. Position nitrogen tank beside left front fender of XM1.
3. Place the following items on the left front fender.
 - a. Accumulator charging device (with adapter installed, if nitrogen tank requires)
 - b. 1 1/8-inch open end wrench
 - c. 9/16-inch combination wrench
 - d. TM 9-2350-255-20-2-3-1
4. Place the following items on the floor of the driver's compartment:
 - a. 3/8-inch combination wrench
 - b. 3/4-inch combination wrench
 - c. 7/16-inch open end wrench
5. Remove the cover and cap from the accumulator and set them aside.

C. PROCEDURE TO PREPARE TO TEST EACH SOLDIER:

1. Depress the Schrader valve on the accumulator for 15 seconds. This will reduce the pressure enough to require performance of the task but reduce the amount of time the task would require if all pressure were eliminated.
2. Traverse the turret so the gun is over the center front of the XM1.
3. Reduce system hydraulic pressure to zero.
4. Disconnect the charging device from the nitrogen tank.

5. Install the manifold pressure gage on the charging device.
6. Open the pressure regulator valve.
7. Open the manifold shut-off valve.
8. Open the manifold bleeder valve.
9. Close the check valve.
10. Lay out the equipment listed in B3 and B4.

D. PROCEDURE TO CONDUCT AND SCORE THE TEST:

1. Read the Instructions To Soldier while both of you are on the ground beside the nitrogen tank.
2. Watch the soldier perform all steps for setting up the charging system.
3. To score PM 1, "Opens nitrogen tank valve briefly . . . ," score only whether air flows out the valve. Do not score the length of time the soldier leaves the valve open.
4. To score PM 2, "Installs charging device . . . ," the device must be tight enough that you cannot hear air escape from the connection.
5. To score PM 3, "Checks tank pressure . . . ," score only whether the scorer does the three listed steps in sequence. However, do monitor the reading. If the pressure is outside the 1000-2000 pound range, stop the test, secure a new tank of nitrogen, and start the test over. Do not score the soldier on whether he detects that the pressure is low or high.
6. PM 6, "Removes manifold pressure gage," may be performed at any time before the soldier asks you to open the nitrogen tank valve. If the gage has not been removed when the soldier enters the tank, be sure it has been removed before you open the nitrogen tank valve. If the soldier does not remove the gage, tell him to remove it; score PM 6 FAIL.
7. When the soldier is ready to enter the XM1, read the Instructions To Soldier (Continued).
8. When the soldier enters the driver's compartment, hand the charging device to the soldier. Put the manifold on the fender in a location where you can see the soldier adjust the valves.
9. During the servicing, you will act under the soldier's direction to control the flow of nitrogen and monitor the pressure gage. For PM 7 and 8, give or stop flow only when the soldier says to. If the soldier does not tell you what the gage should read, ask, "HOW MUCH PRESSURE DO YOU NEED?" If the soldier gives an incorrect answer, mark the PM FAIL, but give the correct amount of pressure.
10. To score PM 6c, "Tightening charging valve at accumulator," climb on the fender and watch the soldier.
11. To score PM 9, "Waits for scorer to check pressure . . . ," monitor the gage for one minute. If the pressure begins to drop during that time, check whether the bleeder valve is open. If it is open, score PM 9 FAIL. If the bleeder valve is closed, find the leak and retest from PM 7. If pressure does not drop, say, "ASSUME THAT THE PRESSURE HAS HELD FOR FIVE MINUTES. CONTINUE WITH THE PROCEDURE."

11. To score PM 12, "Waits for announcement that pressure is zero before removing fitting," watch the gage. If pressure drops steadily, score PM 12 PASS. If the drop is sudden, check whether the soldier has disconnected the charging device from the accumulator. If the device has been disconnected, score PM 12 FAIL. When the gage indicates zero pressure, say, "PRESSURE IS ZERO."
12. To score PM 13, "During zero pressure check (by scorer) pressure drops at 750 ± 50 ," conduct a zero pressure check. First restore hydraulic pressure to the accumulator, then conduct the zero pressure check. If the pressure shows a sharp drop between 800 and 700 pounds, score PM 13 PASS. If there is not a sharp drop, service the accumulator yourself (while the tested soldier assists). If you obtain the proper pressure, score PM 13 FAIL. If you do not obtain the proper pressure, replace the XM1 and repeat the test for PM 7-13.

SCORESHEET

SERVICE MAIN ACCUMULATOR

INSTRUCTIONS TO SOLDIER: For this test you will service the main accumulator. First, set up the charging system. Assume that you just received the nitrogen from supply. You will have 5 minutes to set up the system for charging. Tell me when you are ready to enter the tank.

PERFORMANCE MEASURES

PASS FAIL

1. Opens nitrogen tank valve briefly then closes valve.

2. Installs charging device to nitrogen tank.

3. Checks tank pressure by:

YES NO

a. Closing pressure regulator.

b. Opening nitrogen tank valve.

c. Closing nitrogen tank valve.

(All must be YES.)

4. Performs PM 1-3 in listed sequence.

5. Completes check of tank pressure within 5 minutes.

6. Removes manifold pressure gage.

INSTRUCTIONS TO SOLDIER (Continued): Now charge the main accumulator. The hydraulic pressure has been zeroed. I will control the nitrogen to the levels you direct. Tell me when the accumulator is charged.

7. Purges line before charging accumulator by:

YES NO

a. Telling scorer to open nitrogen tank valve until gage shows 15-20 pounds.

b. Opening manifold shut-off valve after nitrogen valve is opened.

c. Tightening charging valve at accumulator.

(All must be YES.)

8. Tells scorer to give 750-775 pounds pressure.

9. Tells scorer to close nitrogen tank valve.

10. Waits for scorer to check pressure before opening bleeder valve.

11. Opens bleeder valve.

12. Waits for announcement that pressure is zero before removing fitting.

13. During zero pressure check (by scorer) pressure drops at 750 \pm 50.

APPENDIX K
TRAINING RESOURCE REQUIREMENT FORMS

PERSONNEL REQUIREMENTS

Please provide the information requested below for each person involved in the planning, development, conduct, and evaluation of the maintenance training program.

Name: _____ Rank/Grade: _____

Function	Primary (P) or Support (S) Role?	Time Spent on Function
Planning - to include training program scheduling, determining personnel and equipment requirements, etc.	_____	_____
Development - to include writing and review of training scenarios, lesson plans, tests, etc.	_____	_____
Conduct - to include actual training or testing time during implementation of the program, equipment maintenance (support role only), end of course qualification testing, etc.	_____	_____
Evaluation - to include only the testing done at the end of training on the XML for the transfer study. Does <u>not</u> include end of course qualification testing.	_____	_____

EQUIPMENT USE

Please provide the information requested below for each expendable item of equipment required for conduct of the training.

<u>Item</u> (List all items)	<u>Module/Task</u> (List each module/ task for which item is required.)	<u>Number Expended</u> _____ _____
.	.	.
.	.	.
.	.	.

TRAINING REPORT

Please provide the information requested below for each mechanic in the maintenance training program, as follows:

Enter the name of each mechanic on the line labelled "Name."

In the column headed "Task Demo. Date/Time," enter the date and time that the task was demonstrated to the mechanics.

In the column headed "Att" for each mechanic enter the number of times the mechanic was tested on the task during training.

In the column headed "Date/Time" for each mechanic enter the date and time that the mechanic performs the task test to the training standard without coaching.

[illegible]

END OF TRAINING REPORT

Please provide the information requested below for each mechanic in the maintenance training program as follows:

Enter the name of each mechanic on the line labelled "Name."

In the column headed "End of Training Qualification Att." for each mechanic enter the number of times the mechanic was tested on the task during End of Training Qualification testing.

In the column headed "End of Training Qualification Steps Coached" enter for each mechanic the step number of any and all steps on which the mechanic required coaching during any and all attempts of the test. If the mechanic passed the test on the first attempt with no coaching, leave this column blank.

In the column headed "XML GO or Steps Failed or Coached," enter the word GO if the mechanic passed the test on the XML during Job Performance Evaluation. If the mechanic did not pass the test, enter the step number of any steps failed or for which coaching was required.

Name	End of Trng. Qualification		XML GO or Steps Failed or Coached		End of Trng. Qualification		XML GO or Steps Failed or Coached		End of Trng. Qualification		XML GO or Steps Failed or Coached	
	Att.	Coached	Att.	Coached	Att.	Coached	Att.	Coached	Att.	Coached	Att.	Coached
Task												
(List tasks selected for End of Training Qualification Testing.)												

.

Failure Definitions

Failure: Any malfunction that causes or may cause the device to be non-operational, or that causes or may cause damage to the device or personal injury if operations are continued.

Minor Failure: Any failure that the instructor can and does correct by adjustment, repair, or replacement using the controls, tools, and parts authorized, within 15 minutes.

Mission Failure: Any failure that the instructor cannot correct within 15 minutes. Also any failure, including any discovered during preventive (scheduled) maintenance, that requires maintenance or repair beyond the instructor level.

Software Failure: Any failure that is inherent to the device; that is, the failure will occur repeatedly and consistently under certain conditions. Engineering and design errors are included. This failure type will apply mostly to the TOM-T Programmable Maintenance Trainer. Each such failure should be reported only when it first occurs after each repair effort.

Phantom Failure: Any failure that cannot be traced to a specific equipment or software malfunction but occurs two or more times in 24 operational hours.

Abuse Failure: Any failure that occurs because of equipment abuse, operator error, accidental damage to the equipment, or as a result of not adhering to prescribed maintenance procedures.

NOTES:

- A. Simultaneous related malfunctions should be reported as one failure, with all aspects briefly described. If one corrective procedure corrects several malfunctions, they should be considered a single failure.
- B. Simultaneous malfunctions that are unrelated should be reported as two or more failures.
- C. Scheduled replacement of parts prior to failure is not considered a failure.
- D. If a problem is discovered during scheduled maintenance, and corrected by the instructor before the failure occurs, it is not considered a failure.

APPENDIX L
PREREQUISITE KNOWLEDGES AND SKILLS

PREREQUISITE KNOWLEDGES AND SKILLS

The knowledges and skills prerequisite for doing a task can be inferred from an examination of the task analysis outline and an application of four principles to the examination. The four principles are:

1. The mechanic must be able to distinguish the parts, tools, and expendables listed from among any other similar or dissimilar parts, tools, and expendables.
2. The mechanic must be able to make proper use of and properly use the parts, tools, and expendables listed.
3. The mechanic must know the location in or on the tank of the major item of interest in the task.
4. The mechanic must be able to locate task information in the appropriate manual(s).

For example, an examination of the task analysis outline for "Replace turret vent blower inlet screen" (Figure 5) and an application of the four principles to the examination results in the following knowledge and skill requirements.

1. Distinguish the following parts, tools, and expendables from among any other parts, tools, and expendables:

PARTS: Screen, inlet (XM66740).

TOOLS: Brush, wire.

Compressor, air.

Gun, air.

Socket, socket wrench, 3/8 inch square drive, 7/16 inch.

Handle, socket wrench, ratchet, 3/8 inch square drive.

Wrench, torque, 0 to 200 pounds.

EXPENDABLES: Oil, lubricating, OE/HDO-30, MIL-L-2104.

Solvent, cleaning, P-D-680, type II.

2. Make proper use of and properly use the following parts, tools, and expendables:

PARTS: Screen, inlet (XM66740).

TOOLS: Brush, wire.

Compressor, air.

Gun, air.

Socket, socket wrench, 3/8 inch square drive, 7/16 inch.

Handle, socket wrench, ratchet, 3/8 inch square drive.

Wrench, torque, 0 to 200 pounds.

EXPENDABLES: Oil, lubricating, OE/HDO-30, MIL-L-2104.

Solvent, cleaning, P-D-680, type II.

3. Know location in tank of turret vent blower inlet screen.

4. Locate information in TM on how to replace turret vent blower inlet screen. (TM 9-2350-255-20-3-2)

*TASK 2.16.6.3 REPLACE TURRET VENT BLOWER INLET SCREEN

PARTS:	Screen, inlet (XM66740)
TOOLS:	Brush, wire Compressor, air Gun, air Socket, socket wrench, 3/8 inch square drive, 7/16 inch Handle, socket wrench, ratchet, 3/8 inch square drive Wrench, torque, 0 to 200 inch pounds
EXPENDABLES:	Oil, lubricating, OE/HDO-30, MIL-L-2104 Solvent, cleaning P-D-680, type 11

PRELIMINARY PROCEDURE:

1. Traverse turret until main gun is over side of tank and inlet screen is accessible.

MECHANIC WILL:

1. Unscrew and remove six screws and washers using socket and handle.
2. Remove screen.
3. Inspect screen for bent, cracked, or broken areas.
4. If damaged, turn in and replace screen.

<p>WARNING: Solvent burns easily. Do not use near open fire.</p>

5. If screen is not damaged, clean with solvent and brush and dry with air gun.
6. Spread thin coat of oil on threads of six screws.
7. Put screen in place and secure with six screws and washers using socket and handle.
8. Torque six screws between 96 and 120 inch pounds (11 to 14 newton meters) using torque wrench.

FOLLOW ON PROCEDURE:

1. Traverse turret until main gun is over front of tank.

REFERENCES:

DEP 9-2350-20-2-3-2; pp. 5-55 to 5-57.

TIME:

15 minutes

Figure 5. Sample task analysis outline from which to infer knowledge and skill prerequisites.